CRPL-F54

IONOSPHERIC DATA

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PREPARED BY CENTRAL RADIO PROPAGATION LABORATORY
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CONTENTS

SYMBOLS AND TERMINOLOGY; CONVENTIONS FOR DETERMINING MEDIAN VALUES

Beginning with data reported for January 1949, the symbols, terminology, and conventions for the determination of median values used in this report (CRPL-F series) conform as far as practicable to those adopted at the Fifth Meeting of the International Radio Consultative Committee (C.C.I.R.) in Stockholm, 1948, and given in detail on pages 2 to 10 of the report CRPL-F53, "Ionospheric Data," issued January 1949.

For symbols and terminology used with data prior to January 1949, see report IRPL-C61, "Report of International Radio Propagation Conference, Washington, 17 April to 5 May, 1944," previous issues of the F series, in particular, IRPL-F5, CRPL-F24, F33, F50, and report CRPL-7-1, "Preliminary Instructions for Obtaining and Reducing Manual Ionospheric Records."

Following the recommendations of the Washington (1944) and Stockholm (1948) conferences, beginning with data for January 1945, wherever possible median values are published. Where averages are reported, they are, at any hour, the average for all the days during the month for which numerical data exist.

In addition to the conventions for the determination of medians given in Appendix 5 of Document No. 293 E of the Stockholm conference, which are listed on pages 9 and 10 of CRPL-F53, the following conventions are used in determining the medians for hours when no measured values are given because of equipment limitations and ionospheric irregularities. Symbols used are those given on pages 2-9 of CRPL-F53 (Appendixes 1-4 of Document No. 293 E referred to above).

a. For all ionospheric characteristics:

Values missing because of A, B, C, F, L, M, N, Q, R, S, or T (see terminology referred to above) are omitted from the median count.

b. For critical frequencies and virtual heights:

Values of foF2 (and foE near sunrise and sunset) missing because of E are counted as equal to or less than the lower limit of the recorder. Values of h'F2 (and h'E near sunrise and sunset) missing for this reason are counted as equal to or greater than the median. Other characteristics missing because of E are omitted from the median count. See CRPL-F38, page 9.

Values missing because of D are counted as equal to or greater than the upper limit of the recorder.

Values missing because of the G are counted:
1. For foF2, as equal to or less than foFl.
2. For h'F2, as equal to or greater than the median.

Values missing because of W are counted:
1. For foF2, as equal to or less than the median.
2. For h'F2, as equal to or greater than the median.

Values missing for any other reason are omitted from the median count.

c. For muf factors (M-factors):

Values missing because of G or W are counted as equal to or less than the median.

Values missing for any other reason are omitted from the median count.

d. For sporadic E (Es):

Values of fEs missing because of G (no Es reflections observed, the equipment functioning normally otherwise) are counted as equal to or less than the median foE, or equal to or less than the lower frequency count of the recorder.

Values of fEs missing for any other reason, and values of h'Es missing for any reason at all are omitted from the median count.

Beginning with data for November 1945, doubtful monthly median values for ionospheric observations at Washington, D. C., are indicated by parentheses, in accordance with the practice already in use for doubtful hourly values. The following are the conventions used to determine whether or not a median value is doubtful:

1. If only four values or less are available, the data are considered insufficient and no median value is computed.

2. For the F2 layer, if only five to nine values are available, the median is considered doubtful. The E and F1 layers are so regular in their characteristics that, as long as there are at least five values, the median is not considered doubtful.

3. For all layers, if more than half of the values used to compute the median are doubtful (either doubtful or interpolated), the median is considered doubtful.

The same conventions are used by the CRPL in computing the medians from tabulations of daily and hourly data for stations other than Washington, beginning with the tables in IRPL-F18.

MONTHLY AVERAGE AND MEDIAN VALUES OF WORLD-WIDE IONOSPHERIC DATA

The ionospheric data given here in tables 1 to 48 and figures 1 to 94 were assembled by the Central Radio Propagation Laboratory for analysis and correlation, incidental to CRPL predictions of radio propagation conditions. The data are median values unless otherwise indicated. The following are the sources of the data in this issue:

Australian Council for Scientific and Industrial Research,
Radio Research Board:
- Brisbane, Australia
- Canberra, Australia
- Hobart, Tasmania

Australian Department of Supply and Shipping, Bureau of Mineral
Resources, Geophysical Section:
- Watheroo, W. Australia

British Department of Scientific and Industrial Research,
Radio Research Board:
- Lindau/Harz, Germany

New Zealand Radio Research Committee:
- Christchurch, New Zealand (Canterbury University College Observatory)
- Rarotonga I.

South African Council for Scientific and Industrial Research:
- Capetown, Union of S. Africa
- Johannesburg, Union of S. Africa

Japanese Physical Institute for Radio Waves (under supervision of
Supreme Commander, Allied Powers):
- Fukaura, Japan
- Shibata, Japan
- Tokyo, Japan
- Wakkanai, Japan
- Yamaka, Japan

United States Army Signal Corps:
- Okinawa I.

National Bureau of Standards (Central Radio Propagation Laboratory):
- Baton Rouge, Louisiana
- Boston, Massachusetts
- Huancayo, Peru
- Maui, Hawaii
- Palmyra I.

National Bureau of Standards (continued):
San Francisco, California
San Juan, Puerto Rico
Trinidad, British West Indies
Washington, D. C.
White Sands, New Mexico

All India Radio (Government of India), New Delhi, India:
Bombay, India
Delhi, India
Madras, India

Radio Wave Research Laboratory, Central Broadcasting Administration:
Chungking, China
Lanchow, China
Nanking, China
Peiping, China

The tables and graphs of ionospheric data are correct for the values reported to the CRPL, but, because of variations in practice in the interpretation of records and scaling and manner of reporting of values, may at times give an erroneous conception of typical ionospheric characteristics at the station. Some of the errors are due to:

a. Differences in scaling records when spread echoes are present.

b. Omission of values when foF2 is less than or equal to foF1, leading to erroneously high values of monthly averages or median values.

c. Omission of values when critical frequencies are less than the lower frequency limit of the recorder, also leading to erroneously high values of monthly average or median values.

These effects were discussed on pages 6 and 7 of the previous F-series report IRPL-F5.

Ordinarily a blank space in the fEs column of a table is the result of the fact that a majority of the readings for the month are below the lower limit of the recorder. Blank spaces at the beginning and end of columns of h'F1, foF1, h'E, and foE are usually the result of diurnal variation in these characteristics. Complete absence of medians of h'F1 and foF1 is usually the result of seasonal effects.

The dashed-line prediction curves of the graphs of ionospheric data are obtained from the predicted zero-muf contour charts of the CRPL-D series publications. The following points are worthy of note:

a. Predictions for individual stations used to construct the charts may be more accurate than the values read from the charts since some smoothing of the contours is necessary to allow for the longitude effect within a zone. Thus, inasmuch as the predicted contours are for the center of each zone, part of the discrepancy between the predicted and observed values as given in the F series may be caused by the fact that the station is not centrally located within the zone.

b. The final presentation of the predictions is dependent upon the latest available ionospheric and radio propagation data, as well as upon predicted sunspot number.

c. There is no indication on the graphs of the relative reliability of the data; it is necessary to consult the tables for such information.

The following predicted smoothed 12-month running-average Zürich sunspot numbers were used in constructing the contour charts:

Month	Predicted Sunspot No.				
	1949	1948	1947	1946	1945
December		114	126	85	38
November		115	124	83	36
October		116	119	81	23
September		117	121	79	22
August		123	122	77	20
July		125	116	73	
June		129	112	67	
May		130	109	67	
April		133	107	62	
March		133	105	51	
February		133	90	46	
January	112	130	88	42	

IONOSPHERIC DATA FOR EVERY DAY AND HOUR AT WASHINGTON, D. C.

The data given in tables 49 to 60 follow the scaling practices given in the report IRPL-C61, "Report of International Radio Propagation Conference," pages 36 to 39, and the median values are determined by the conventions given above under "Symbols and Terminology; Conventions for Determining Median Values."

IONOSPHERE DISTURBANCES

Table 61 presents ionosphere character figures for Washington, D. C., during January 1949, as determined by the criteria presented in the report IRPL-R5, "Criteria for Ionospheric Storminess," together with Cheltenham, Maryland, geomagnetic K-figures, which are usually covariant with them.

Table 62 lists for the stations whose locations are given the sudden ionosphere disturbances observed on the continuous field intensity recordings made at the Sterling Radio Propagation Laboratory during January 1949.

Table 63 lists for the stations whose locations are given the sudden ionosphere disturbances observed at the Brentwood and Somerton, England, receiving stations of Cable and Wireless, Ltd., for December 23 and 30, 1948.

Table 64 lists for the stations whose locations are given the sudden ionosphere disturbances observed at the Point Reyes, California, Receiving Station of RCA Communications, Inc., for January 14, 15, and 23, 1949.

Table 65 lists for the stations whose locations are given the sudden ionosphere disturbances observed at the Platanos, Argentina, receiving station of the International Telephone and Telegraph Corporation for December 3, 7, 9, 20, 23, 24, and 27, 1948.

Table 66 gives provisional radio propagation quality figures for the North Atlantic and North Pacific areas, for 01 to 12 and 13 to 24 GCT, December 1948, compared with the CRPL daily radio disturbance warnings, which are primarily for the North Atlantic paths, the CRPL weekly radio propagation forecasts of probable disturbed periods, and the half-day Cheltenham, Maryland, geomagnetic K-figures.

The radio propagation quality figures are prepared from radio traffic and ionospheric data reported to the CRPL, in a manner basically the same as that described in IRPL-R31, "North Atlantic Radio Propagation Disturbances, October 1943 through October 1945," issued February 1, 1946. The scale conversions for each report are revised for use with the data beginning January 1948, and statistical weighting replaces what was, in effect, subjective weighting. Separate master distribution curves of the type described in IRPL-R31 were derived for the part of 1946 covered by each report; data received only since 1946 are compared with the master curve for the period of the available data. A report whose distribution is the same as the master is thereby converted linearly to the Q-figure scale. Each report is given a statistical weight which is the reciprocal of the departure from linearity. The half-daily radio propagation quality figure, beginning January 1948, is the weighted mean of the reports received for that period.

These radio propagation quality figures give a consensus of opinion of actual radio propagation conditions as reported by the half day over the two general areas. It should be borne in mind, however, that though the quality may be disturbed according to the CRPL scale, the cause of the disturbance is not necessarily known. There are many variables that must be considered. In addition to ionospheric storminess itself as the cause, conditions may be reported as disturbed because of seasonal characteristics such as are particularly evident in the pronounced day and night contrast over North Pacific paths during the winter months, or because of improper frequency usage for the path and time of day in question. Insofar as possible, frequency usage is included in rating the reports. Where the actual frequency is not shown in the report to the CRPL, it has been assumed that the report is made on the use of optimum working frequencies for the path and time of day in question. Since there is a possibility that all the disturbance shown by the quality figures is not due to ionospheric storminess alone, care should be taken in using the quality figures in research correlations with solar, auroral, geomagnetic, or other data. Nevertheless, these quality figures do reflect a consensus of opinion of actual radio propagation conditions as found on any one half day in either of the two general areas.

AMERICAN AND ZÜRICH PROVISIONAL RELATIVE SUNSPOT NUMBERS

Table 67 presents the daily American relative sunspot number, R_A, computed from observations communicated to CRPL by observers in America and abroad. Beginning with the observations for January 1948, a new method of reduction of observations is employed such that each observer is assigned a scale-determining "observatory coefficient," ultimately referred to Zürich observations in a standard period, December 1944 to September 1945, and a statistical weight, the reciprocal of the variance of the observatory coefficient. The daily numbers listed in the table are the weighted means of all observations received for each day. Details of the procedure will be published shortly. The American relative sunspot number computed in this way is designated R_A. It is noted that a number of observatories abroad, including the Zürich observatory, are included in R_A. The scale of R_A was referred specifically to that of the Zürich relative sunspot numbers in the standard comparison period; since that time, R_A is influenced by the Zürich observations only in that Zürich proves to be a consistent observer and receives a high statistical weight. In addition, this table lists the daily provisional Zürich sunspot numbers, R_Z.

SOLAR CORONAL INTENSITIES OBSERVED AT CLIMAX, COLORADO

In tables 68a and 68b are listed the intensities of green (5303A) line of the emission spectrum of the solar corona as observed during January 1949 by the High Altitude Observatory of Harvard University and the University of Colorado at Climax, Colorado, for east and west limbs, respectively, at 5° intervals of position angle north and south of the solar equator at the limb computed to the nearest 5°. A correction, P, as listed, has been applied to the position angles of the actual observations which were on astronomical coordinates. The time of observation is given to the nearest tenth of a day, GCT. The tables of coronal observations in CRPL-F29 to F41 listed the data on astronomical coordinates; the present format on solar rotation coordinates is in conformity with the tables of CRPL-1-4, "Observations of the Solar Corona at Climax, 1944-46."

Tables 69a and 69b give similarly the intensities of the first red (6374A) coronal line; tables 70a and 70b list the intensities of the second red (6704A) coronal line. The following symbols are used in tables 68, 69, and 70: a, observation of low weight; -, corona not visible; and x, position angle not included in plate estimates.

Table 1

Washington, D.C. (39.0°N, 77.5°W) January 1949

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	270	4.2						2.9
01	280	4.1						2.8
02	270	4.0						2.9
03	260	3.9						2.9
04	250	4.0						2.9
05	250	3.7						2.9
06	250	3.3						3.0
07	250	4.1						3.0
08	220	7.6			130	2.2		3.4
09	220	9.4			110	2.7		3.3
10	225	10.6	210		100	3.1	3.2	3.2
11	230	11.8	220		100	3.4	2.9	3.2
12	230	12.1	210		100	3.4		3.1
13	235	12.0	210		100	3.4		3.1
14	230	11.5	210		100	3.2		3.0
15	230	11.5	220		100	3.0		3.1
16	230	11.3			110	2.6	1.9	3.1
17	220	(10.6)			130	2.0	2.0	3.1
18	210	(9.4)						3.1
19	220	8.0						3.1
20	220	6.6						3.0
21	230	5.1						3.0
22	250	4.7						2.9
23	250	4.7						2.9

Time: 75.0°W.
Sweep: 1.0 Mc to 25.0 Mc in 15 seconds.

Table 2

Lindau/Harz, Germany (51.6°N, 10.1°E) December 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	310	3.0					2.4	
01	305	3.1					2.4	
02	305	3.1					2.4	
03	305	2.7					2.3	
04	300	2.5					2.4	
05	295	2.6					2.1	
06	270	2.7					2.4	
07	285	2.6					2.4	
08	210	5.1					2.2	
09	205	8.1			120	2.0	3.2	
10	205	10.1			105	2.4	3.5	
11	205	11.0			100	2.6	3.4	
12	205	11.3			105	2.8	3.4	
13	205	11.2			100	2.6	3.4	
14	205	11.3			105	2.5	3.4	
15	200	10.6			105	2.2	3.4	
16	200	9.0			130	1.8	2.9	
17	200	7.1					2.7	
18	205	6.1					2.6	
19	205	4.6					2.4	
20	220	3.4					2.1	
21	290	2.8					2.2	
22	300	2.9						
23	300	3.0					2.2	

Time: 15.0°E.
Sweep: 1.4 Mc to 16.0 Mc in 7 minutes.

Table 3

Boston, Massachusetts (42.4°N, 71.2°W) December 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	285	4.4						2.7
01	275	4.2						2.6
02	272	4.2					1.2	2.6
03	250	3.8						2.7
04	242	3.8						2.8
05	250	3.8						2.7
06	260	3.8						2.8
07	240	5.8						3.0
08	225	9.0						3.2
09	230	10.6						3.1
10	240	10.9						3.1
11	245	11.2						3.1
12	248	11.3						3.1
13	240	11.4						3.0
14	242	11.2						3.0
15	232	11.3						3.0
16	225	10.8						3.0
17	230	10.0						3.0
18	235	8.1						2.9
19	240	6.8						2.9
20	248	5.8						2.9
21	260	5.0						2.7
22	275	4.8						2.7
23	282	4.6						2.6

Time: 75.0°W.
Sweep: 0.8 Mc to 14.0 Mc in 1 minute.

Table 4

San Francisco, California (37.4°N, 122.2°W) December 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	300	3.0					2.6	2.5
01	290	3.0					2.5	2.6
02	285	3.1					2.5	2.6
03	280	3.1					2.5	2.7
04	280	3.1					2.5	2.6
05	290	3.0					2.5	2.5
06	300	3.0					2.6	2.6
07	260	5.0					2.6	2.8
08	230	8.2			120	2.4		3.1
09	230	9.8			120	2.8		3.1
10	220	10.4			120	3.3		3.0
11	220	11.5			120	3.4		2.9
12	230	12.0			120.	3.5		2.9
13	240	12.0			120	3.4		2.9
14	230	11.5			120	3.3		2.9
15	230	11.0			120	2.9		2.9
16	230	10.5			120	2.5		3.0
17	210	9.2					2.5	3.0
18	220	6.6					2.5	2.8
19	220	5.4					2.5	3.0
20	230	4.0					2.4	3.0
21	240	2.8					2.5	2.9
22	280	2.6					2.6	2.6
23	320	2.9					2.6	2.6

Time: 120.0°W.
Sweep: 1.3 Mc to 18.0 Mc in 4 minutes 30 seconds.

Table 5

White Sands, New Mexico (32.3°N, 106.5°W) December 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	300	3.2					2.8	2.6
01	280	3.3					3.1	2.7
02	280	3.5					2.9	2.7
03	270	3.6					2.9	2.7
04	260	3.5					2.6	2.8
05	280	3.4					2.6	2.6
06	280	3.4					2.6	2.7
07	260	6.0				(1.8)	2.9	3.0
08	240	9.5			120	2.5	3.2	3.2
09	240	10.4			120	3.0	3.9	3.2
10	230	10.9			120	3.3	3.9	3.1
11	230	11.6			120	3.5	4.3	3.0
12	240	12.1			120	3.5		3.0
13	240	11.8			120	3.5	4.6	2.9
14	240	11.5			110	3.3	4.4	2.9
15	240	11.2			110	2.9	4.1	3.0
16	230	10.6			115	2.5	3.8	3.0
17	220	9.6					3.7	3.0
18	220	7.2					3.4	(3.0)
19	230	6.3					3.8	3.1
20	230	4.6					3.3	3.1
21	250	3.4					3.3	3.1
22	270	3.1					3.3	2.8
23	300	3.1					3.3	2.6

Time: 105.0°W.
Sweep: 0.78 Mc to 14.0 Mc in 2 minutes.

Table 6

Baton Rouge, Louisiana (30.5°N, 91.2°W) December 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	300	3.7						2.9
01	290	3.8						2.9
02	290	3.8						3.0
03	280	3.8						3.0
04	290	3.8						3.0
05	300	3.8						2.9
06	280	3.8						3.0
07	260	7.2						3.2
08	260	10.0	230		130	2.6		3.3
09	270	10.8	230		120	3.1		3.2
10	280	11.2	230		120	3.4		3.2
11	280	11.5	220		120	3.5		3.1
12	290	11.8	230		120	3.6		3.0
13	290	11.8	230		120	3.6		3.0
14	290	11.5	230		120	3.4		3.0
15	290	11.3	240		120	3.1		3.0
16	280	10.7	230		125	2.7		3.0
17	260	9.6						3.1
18	230	7.7						3.1
19	230	6.6						3.1
20	240	5.1						3.1
21	250	4.2						3.1
22	270	3.7						3.1
23	290	3.7						3.0

Time: 90.0°W.
Sweep: 2.12 Mc to 15.3 Mc in 8 minutes 30 seconds, automatic operation.

Table 7

Okinawa I. (26.3°N, 127.7°E) December 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00		5.8						2.8
01		5.5						2.8
02		5.8						2.8
03		5.2						2.9
04		4.2						3.2
05		3.8						(3.2)
06		3.0						3.0
07		5.4				E		2.9
08		9.3				E		3.2
09		12.4				E	3.4	3.3
10		13.0					3.8	3.3
11		12.2					4.0	3.2
12		13.3					4.2	3.0
13		14.2					4.2	3.0
14		14.2					4.0	3.0
15		14.5					3.8	3.1
16		13.4				E	3.6	3.0
17		13.4				E		3.1
18		11.9				E		3.2
19		10.3						(3.1)
20		9.8						3.1
21		9.2						3.1
22		(8.4)						(3.2)
23		7.3						3.0

Time: 135.0°E.
Sweep: 3.2 Mc to 18.0 Mc in 15 minutes, manual operation.

Table 8

Maui, Hawaii (20.8°N, 156.5°W) December 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	240	4.1						3.2
01	250	3.6						3.2
02	250	3.8						3.3
03	250	3.4						3.1
04	300	3.0						2.8
05	330	2.8						2.8
06	300	2.8						2.9
07	260	5.6				E		3.0
08	240	9.8			110	2.6		3.2
09	250	12.8	230		110	3.2		3.2
10	240	13.5	220		110	3.4		3.3
11	250	12.6	210		110	3.6		3.1
12	250	13.2	210		100	3.7		3.0
13	260	14.0	210		105			3.0
14	260	14.2	205		100	3.6		(3.0)
15	250	14.2	210		100	3.4		3.0
16	240	14.4			100	3.0		3.0
17	220	13.0			115	2.6		3.2
18	210	12.2				E		3.3
19	200	9.2						(3.3)
20	220	7.8						3.0
21	225	7.8						3.1
22	225	7.8						3.2
23	230	6.0						3.2

Time: 150.0°W.
Sweep: 2.2 Mc to 16.0 Mc in 1 minute; above 16.0 Mc, manual operation.

Table 9

San Juan, Puerto Rico (18.4°N, 66.1°W) December 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00		5.2						2.9
01		5.3						2.9
02		4.8						3.0
03		4.5						3.0
04		4.1						2.7
05		4.3						2.8
06		4.6						2.8
07	250	7.6		3.0				3.0
08	250	10.4		3.6		E		3.1
09	260	12.0		4.2		3.3		3.1
10	250	12.1				3.6		3.1
11	260	11.5				3.8		3.0
12	265	11.1				3.8		2.9
13	280	11.1				3.9		2.9
14	290	11.5				3.8		2.9
15	280	11.5				3.5		2.8
16	260	11.1				3.2		2.9
17	250	11.0		3.6				2.9
18	250	10.0						3.0
19	240	8.3						2.9
20		6.6						2.9
21		6.4						2.9
22		6.2						2.9
23		5.9						2.9

Time: 60.0°W.
Sweep: 2.8 Mc to 13.0 Mc in 9 minutes, supplemented by manual operation.

Table 10

Trinidad, Brit. West Indies (10.6°N, 61.2°W) December 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	230	6.6						3.2
01	230	5.2						3.1
02	250	4.2					1.9	3.1
03	260	3.6					2.0	3.0
04	300	3.6					2.0	2.8
05	280	3.9					2.2	2.8
06	270	5.0					2.6	2.9
07	250	8.8			120	2.4	2.9	3.2
08	240	11.4			120	3.1	3.8	3.2
09	250	12.7	230	4.6	120	3.4	4.0	3.2
10	260	12.9	220	4.9	120	3.7	4.3	3.1
11	270	12.6	220	5.0	120	3.8	4.6	3.0
12	270	11.6	220	5.1	120	3.8	4.6	3.0
13	280	11.7	220	5.1	120	3.8	4.6	2.9
14	280	11.5	225	5.0	120	3.7	4.4	2.8
15	260	11.3	230	4.6	120	3.5	4.6	2.8
16	250	11.2	240	(5.0)	120	3.2	4.8	2.9
17	250	11.2			120	2.6	3.8	2.9
18	250	10.8					3.6	3.0
19	230	9.6					3.2	3.0
20	230	8.4					3.0	3.0
21	260	7.6					2.8	2.8
22	260	7.5					2.1	2.9
23	250	7.2					2.0	3.1

Time: 60.0°W.
Sweep: 1.2 Mc to 18.0 Mc, manual operation.

Table 11

Palmyra I. (5.9°N, 162.1°W) December 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	250	9.2					4.0	(3.0)
01	250	(8.0)					3.7	(3.0)
02	260	(6.8)					3.0	(2.9)
03	270	6.1					2.8	(2.8)
04	260	5.9					3.2	(2.9)
05	250	5.4					2.8	3.0
06	280	5.2					2.6	2.8
07	280	8.2			140	2.4	3.3	2.8
08	250	11.5			120	3.1	3.8	2.8
09	250	13.0	240		120	3.6	4.0	2.7
10	280	13.5	230		120	3.8		2.5
11	280	12.8	230		120	4.1		2.4
12	280	12.4	220		120	4.0		2.4
13	27C	12.4	220		120	4.1		2.4
14	270	12.4	220		120	3.8	4.1	2.4
15	255	13.0	200	4.0	120	3.6	3.9	2.4
16	250	13.5	200	3.6	120	3.3	4.2	2.5
17	260	13.8			130	2.8	4.3	2.6
18	280	13.8			160		3.8	2.7
19	300	13.7					3.8	2.6
20	290	14.0					3.4	(2.5)
21	270	13.4					3.6	2.6
22	270	12.4					4.0	2.8
23	250	11.3					4.5	(2.9)

Time: 157.5°W.
Sweep: 1.0 Mc to 13.0 Mc in 1 minute 36 seconds, automatic operation; 13.0 Mc to 18.0 Mc, manual operation.

Table 12

Huancayo, Peru (12.0°S, 75.3°W) December 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	345	7.6						(2.6)
01	305	(7.2)						(2.9)
02	280	(7.0)						(3.2)
03	250	6.4					1.3	3.2
04	230	5.5						3.2
05	250	4.4						3.0
06	260	8.2				2.3	3.7	3.0
07	240	10.6				3.0	5.2	2.9
08	230	12.4				3.6	5.5	2.9
09	270	13.0	220	5.5		3.9	8.4	2.7
10	290	13.4	210	5.4		4.1	11.9	2.4
11	260	13.2	210	5.4		4.2	8.4	2.4
12	275	13.0	210	5.4		4.2	8.4	2.3
13	280	12.8	200	5.3		4.2	10.7	2.3
14	270	13.1	210	5.4		4.0	11.9	2.3
15	220	13.0				3.8	11.4	2.3
16	220	12.9				3.3	8.7	2.3
17	250	13.0				2.7	5.5	2.3
18	280	12.4				1.8	3.2	2.2
19	320	11.5				0.8		2.3
20	360	11.0						2.2
21	380	9.6						2.2
22	380	9.4						2.4
23	350	(8.0)						(2.6)

Time: 75.0°W.
Sweep: 16.0 Mc to 0.5 Mc in 15 minutes, automatic operation.

Table 13

Lindau/Harz, Germany (51.6°N, 10.1°E) November 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	300	3.4					3.0	
01	300	3.4					3.0	
02	300	3.5					2.9	
03	300	3.2					2.9	
04	300	3.0					3.0	
05	280	2.9					2.9	
06	280	2.7					2.9	
07	250	4.3					2.9	
08	210	7.6			110	2.0	3.0	
09	210	9.1			105	2.4	3.2	
10	210	11.1			105	2.7	3.1	
11	210	11.8			100	2.9	3.2	
12	210	11.8			100	3.0	3.2	
13	210	11.6			100	2.9	3.1	
14	220	11.6			100	2.8	3.0	
15	210	11.6			105	2.4	3.1	
16	205	10.3			100	2.0	3.1	
17	205	9.6					3.0	
18	205	7.4					3.0	
19	210	6.5					3.0	
20	210	4.8					2.9	
21	270	3.8					3.0	
22	305	3.9					2.9	
23	305	3.7					2.7	

Time: 15.0°E.
Sweep: 1.0 Mc to 16.0 Mc in 12 minutes.

Table 14

Peiping, China (39.9°N, 116.4°E) November 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00								
01								
02		5.8						
03		6.3						
04		5.7						
05		5.3						
06		5.3						
07		7.1						
08								
09								
10		12.0						
11		12.0						
12		12.0						
13		12.3						
14		11.8						
15		11.7						
16								
17								
18		9.2						
19		8.3						
20		7.4						
21		7.0						
22		6.4						
23		5.8						

Time: 120.0°E.
Sweep: 2.3 Mc to 15.0 Mc in 15 minutes, manual operation.

Table 15

Chungking, China (29.4°N, 106.8°E) November 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	260	6.6						2.6
01	250	5.9						2.6
02	260	5.1						2.7
03	260	4.7						2.8
04	260	3.9						2.8
05	280	3.6						2.6
06	240	4.4						2.9
07	240	8.7	240				3.8	3.3
08	240	11.0	220		100	3.3	4.2	3.0
09	250	12.8	220		100	3.3	4.3	2.9
10	260	14.2	230		100	3.4	4.4	2.8
11	280	14.6	220		100	3.8	4.4	2.8
12	290	14.6	230	6.2	100	3.7	4.5	2.6
13	310	16.5	230	5.4	120	3.8	4.5	2.6
14	295	16.3	240		120	3.4	4.2	2.6
15	260	15.3	240		100	3.2	4.2	2.7
16	240	15.0	240		100	2.6	4.0	2.7
17	240	15.1	220				3.7	2.9
18	220	14.3					3.6	2.7
19	230	13.0					2.8	2.7
20	220	14.0						2.8
21	230	10.3						2.7
22	240	8.4						2.7
23	260	7.8						2.6

Time: 105.0°E.
Sweep: 1.5 Mc to 20.0 Mc in 15 minutes, manual operation.

Table 16

Okinawa I. (26.3°N, 127.7°E) November 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00		9.0						2.9
01		8.3						3.0
02		8.0						3.0
03		6.4						3.1
04		5.6						3.2
05		3.8						2.8
06		3.9						2.8
07		7.5						(3.1)
08		11.2					3.2	(3.3)
09		13.0					3.7	(3.2)
10		13.8					4.0	3.1
11		14.0					4.2	(3.0)
12		14.3					4.2	2.9
13		15.3					4.4	(2.9)
14		15.7					4.2	(2.9)
15		15.6					4.2	(2.9)
16		16.0					3.8	(3.0)
17		15.1					3.4	(3.0)
18		14.5						(3.0)
19		(14.0)						(2.9)
20		(14.9)						(2.9)
21		14.0						(3.0)
22		(11.6)						(3.1)
23		10.0						3.0

Time: 135.0°E.
Sweep: 3.2 Mc to 18.0 Mc in 15 minutes, manual operation.

Table 17

Johannesburg, Union of S. Africa (26.2°S, 28.0°E) November 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	(275)	7.0					1.7	2.8
01	(260)	6.5						2.8
02	(260)	5.9						2.8
03	(260)	5.5						2.8
04	(270)	5.3						2.7
05	280	5.6						2.8
06	250	7.6	240		110	2.4		3.1
07	250	8.8	230		110	3.0		2.9
08	265	10.0	210	4.4	110	3.4		2.8
09	300	10.6	210	5.5	110	3.7	3.9	2.7
10	320	11.0	200	5.8	110	(3.8)	4.0	2.6
11	350	11.7	200	5.9	110	(4.0)	4.1	2.6
12	340	12.0	210	5.9	110	(4.1)		2.6
13	350	12.0	215	6.0	110	4.0		2.6
14	350	12.0	220	6.0	110	3.9		2.6
15	330	11.8	220	5.9	110	3.7		2.7
16	310	11.5	230	5.1	110	3.4	3.5	2.7
17	280	11.1	235		100	2.9	3.3	2.7
18	250	10.9			100	2.1	2.3	2.8
19	240	10.5					2.4	2.8
20	240	9.7					2.0	2.8
21	250	8.8					2.1	2.8
22	(260)	8.0					1.9	2.8
23	(280)	7.3					1.6	2.7

Time: 30.0°E.
Sweep: 1.0 Mc to 15.0 Mc in 7 seconds.

Table 18

Watheroo, W. Australia (30.3°S, 115.9°E) November 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	300	6.9					3.6	2.6
01	285	6.6					3.8	2.6
02	300	5.9					3.9	2.5
03	300	5.7					3.1	2.5
04	300	5.4					3.0	2.5
05	300	5.6				1.7	3.1	2.6
06	260	6.2				2.4	3.2	2.8
07	340	7.0	240	4.8		3.0	3.4	2.7
08	350	8.0	245	5.1		3.4	4.2	2.6
09	360	8.2	230	5.3		3.7	4.1	2.6
10	385	9.8	230	5.6		3.8	4.6	2.5
11	365	10.3	230	5.6		3.8	4.5	2.5
12	385	[illegible]	235	5.6		3.9	4.5	2.5
13	390	10.2	240	5.7		3.9	4.4	2.5
14	390	10.0	240	5.6		3.6	4.3	2.5
15	330	9.8	240	5.4		3.6	4.1	2.6
16	360	9.6	250	5.3		3.2	3.8	2.6
17	285	9.2	260	4.5		2.8	3.8	2.6
18	270	9.2				2.1	3.1	2.7
19	270	9.0					2.8	2.7
20	270	9.2					3.1	2.6
21	285	7.4					3.2	2.6
22	300	7.1					3.4	2.5
23	320	7.2					3.9	2.6

Time: 120.0°E.
Sweep: 16.0 Mc to 0.5 Mc in 15 minutes, automatic operation.

Table 19

Capetown, Union of S. Africa (34.2°S, 18.3°E) November 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	(290)	5.7					2.1	2.7
01	(290)	5.6					2.1	2.7
02	(290)	5.4					2.1	2.7
03	(290)	5.1					2.0	2.8
04	(280)	4.8					1.7	2.6
05	(300)	4.7						2.7
06	260	6.4			110	2.0		2.9
07	260	8.0	240		120	2.7		2.9
08	280	9.1	230	5.0	110	3.1		2.8
09	310	10.1		5.0	110	(3.5)		2.7
10	340	10.6		(5.9)	110			2.6
11	340	11.1		5.7	110			2.6
12	350	(11.6)		6.1	110			(2.6)
13	360	11.8		6.1	110			(2.6)
14	350	11.8		5.8	110			2.6
15	340	11.6		5.8	110			2.6
16	330	11.2		5.5	110	3.4	3.6	2.7
17	300	11.0	230	4.0	110	3.1		2.7
18	270	10.7	245		110	2.7		2.8
19	250	10.0			110	2.0		2.9
20	240	9.0					2.1	2.9
21	(250)	7.9					2.5	2.8
22	(250)	7.1					2.3	2.8
23	(270)	6.4					2.0	2.8

Time: 30.0°E.
Sweep: 1.0 Mc to 15.0 Mc in 7 seconds.

Table 20

Christchurch, New Zealand (43.5°S, 172.7°E) November 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	305	7.8					2.8	2.6
01	310	7.3					2.7	2.5
02	300	6.8					2.8	2.5
03	300	6.3					2.8	2.6
04	300	6.1					2.8	2.6
05	275	6.0				1.5	2.8	2.8
06	260	6.4	250	4.2		2.5		2.9
07	310	7.0	250	4.7		3.0	4.4	2.8
08	340	7.7	240	5.0		3.3	4.4	2.8
09	340	8.2	230	5.3		3.6	5.2	2.8
10	365	8.6	240	5.6		3.7	4.8	2.7
11	360	8.8	230	5.7		3.7		2.7
12	370	8.8	230	5.7		3.7		2.7
13	370	8.6	230	5.6		3.7		2.7
14	360	8.9	230	5.7		3.5		2.7
15	350	8.9	230	5.5		3.4		2.7
16	320	9.0	240	5.2		3.3		2.7
17	270	8.8	250	4.6		2.9	2.8	2.7
18	270	9.2				2.3	3.8	2.7
19	270	9.3				1.3	3.6	2.7
20	280	9.1					3.4	2.6
21	290	8.8					3.2	2.5
22	300	8.5					2.8	2.5
23	310	8.0					2.7	2.5

Time: 172.5°E.
Sweep: 1.0 Mc to 13.0 Mc.

Table 21

Wakkanai, Japan (45.4°N, 141.7°E) October 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	290	4.8					2.6	2.6
01	300	4.6					2.3	2.6
02	290	4.4					2.2	2.6
03	290	4.6					2.1	2.7
04	280	4.6					2.3	2.6
05	280	4.6					2.4	2.7
06	230	6.5			100	1.7	2.5	3.0
07	220	9.1			100	2.4	2.7	3.2
08	210	11.3	210		100	2.8	3.4	3.2
09	220	11.2			100	3.2	3.7	3.1
10	230	11.6	210		100	3.3	4.5	3.2
11	230	12.2	210		100	3.4	3.9	(3.1)
12	240	12.1	220		100	3.4	3.7	3.1
13	245	11.8	225		100	3.4	3.6	3.1
14	240	11.6			100	3.2	3.2	3.0
15	220	11.4			100	2.8	3.4	3.1
16	220	10.5			100	2.5	2.9	3.2
17	210	9.4				1.8	3.1	3.2
18	210	8.4					3.0	3.0
19	215	7.2					3.2	3.0
20	220	6.2					2.9	3.0
21	250	5.6					[illegible]	2.9
22	270	5.3					[illegible]	2.8
23	290	5.0					2.2	2.7

Time: 135.0°E.
Sweep: 1.0 Mc to 17.0 Mc, manual operation.

Table 22

Fukaura, Japan (40.6°N, 139.9°E) October 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	320	5.4					2.4	2.5
01	310	5.1					2.2	2.6
02	300	4.9					2.2	2.5
03	295	5.0					2.6	2.6
04	300	4.6					2.2	2.6
05	300	4.8					2.2	2.6
06	235	7.2			120	1.8	2.2	3.0
07	230	10.0			120	2.4	3.0	3.2
08	240	10.6	220		110	3.0	3.6	3.3
09	240	(11.0)	220		110		(4.0)	(3.2)
10	250	(11.2)			110		(4.0)	(3.2)
11	240	(11.4)	230		110		(4.8)	(3.0)
12	250	11.6			110		(4.8)	(3.1)
13	250	11.6	220		110		(4.5)	3.1
14	250	11.6	220		110		(3.7)	3.1
15	250	11.4	240		110	3.0	3.4	3.1
16	240	11.2	230		110	2.5	3.0	3.1
17	230	10.4			110	1.6	3.2	3.1
18	230	(9.0)					(3.4)	(3.0)
19	240	7.7					2.6	3.0
20	250	6.6					3.2	2.9
21	250	5.8					2.9	2.8
22	290	5.7					3.0	2.7
23	300	5.5					2.8	2.5

Time: 135.0°E.
Sweep: 1.0 Mc to 17.0 Mc, manual operation.

Table 23

Peiping, China (39.9°N, 116.4°E) October 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00								
01								
02		7.2						
03		7.2						
04		7.2						
05		7.0						
06		7.8						
07		9.0						
08								
09								
10		12.0						
11		12.3						
12		12.2						
13		12.3						
14		11.8						
15		11.8						
16								
17								
18		10.7						
19		9.4						
20		8.4						
21		8.0						
22		7.7						
23		7.4						

Time: 120.0°E.
Sweep: 2.3 Mc to 15.0 Mc in 15 minutes.

Table 24

Shibata, Japan (37.9°N, 139.3°E) October 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	300	5.5					2.9	2.7
01	300	5.3					2.8	2.6
02	280	5.2					2.7	2.8
03	270	5.1					2.6	2.8
04	270	4.6					2.4	2.6
05	290	4.7					2.2	2.8
06	230	6.8	220		110	1.8	2.6	3.3
07	220	10.1	215		100	2.5	2.9	3.4
08	220	11.3	220		100	3.0	4.0	3.4
09	215	12.2	210		100	3.3	4.1	3.3
10	240	13.0	210		100	3.4	4.0	3.1
11	230	13.2	210		100	3.6	4.0	3.1
12	240	13.0	210		100	3.5	3.9	3.1
13	250	12.8	220		100	3.5	3.8	3.0
14	240	12.3	215		100	3.4	3.8	3.1
15	230	11.9	210		100	3.2	3.4	3.2
16	220	11.6	210		100	2.6	3.6	3.2
17	210	10.6				(1.8)	3.1	3.4
18	210	9.4	220				3.3	3.2
19	220	7.5					3.2	3.2
20	235	6.3					3.2	3.0
21	250	5.5					3.0	3.0
22	270	5.2					2.8	2.8
23	300	5.0					2.8	2.7

Time: 135.0°E.
Sweep: 1.0 Mc to 17.0 Mc in 15 minutes, manual operation.

Table 25

Lanchow, China (36.1°N, 103.8°E) October 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	340	6.8					3.0	2.4
01	355	6.6						2.4
02	365	6.1						2.3
03	360	6.2						2.3
04	360	5.3						2.3
05	380	5.5						2.3
06	340	6.4						2.5
07	330	9.6	300		140	3.0	3.3	2.6
08	320	13.0	290		150	3.2	4.2	2.6
09	320	13.5	290		140	3.4	4.4	2.6
10	340	14.1	280		140	3.5	4.5	2.5
11	335	14.5	280	5.4			4.4	2.5
12	340	14.5	280				4.3	2.5
13	340	14.0	300				4.0	2.4
14	370	14.1	300				4.4	2.4
15	355	14.2	300				4.0	2.4
16	340	14.4	300		150	3.2	3.3	2.5
17	340	13.5	300				3.5	2.4
18	340	12.4	285				3.6	2.4
19	320	(9.2)					3.0	(2.5)
20	320	(9.1)					3.4	(2.5)
21	320	8.4					3.0	2.4
22	340	8.0					3.2	2.3
23	345	7.2						2.4

Time: 105.0°E.
Sweep: 2.4 Mc to 16.0 Mc in 15 minutes, manual operation.

Table 26

Tokyo, Japan (35.7°N, 139.5°E) October 1946

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	280	5.2					2.6	2.7
01	285	5.2					2.9	2.8
02	280	5.0					2.5	2.8
03	260	5.0					2.6	2.7
04	270	4.4					2.2	2.6
05	270	4.6					2.2	2.8
06	230	7.1			120	1.9	2.3	3.2
07	220	10.2			100	2.5	3.2	3.3
08	220	12.0	210		100	3.0	4.0	3.3
09	230	12.8	215		100	3.2	4.6	3.2
10	230	13.1	210		100	3.3	4.2	3.2
11	240	13.6	220		100		4.6	3.0
12	240	13.6	220		100		(4.0)	3.0
13	250	13.4	220		100		(4.2)	3.1
14	250	13.1	220		100	3.5	4.2	3.0
15	240	12.2	220		100	3.2	3.6	3.2
16	230	11.6	220		100	2.7	3.7	3.2
17	220	11.2			100	2.0	3.6	3.3
18	210	9.2					3.5	3.2
19	220	7.5					3.6	3.2
20	230	6.5					3.4	3.1
21	250	5.8					3.3	3.0
22	270	5.4					3.2	2.9
23	285	5.1					3.0	2.9

Time: 135.0°E.
Sweep: 1.0 Mc to 16.0 Mc in 15 minutes, manual operation.

Table 27

Yamakawa, Japan (31.2°N, 130.6°E) October 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	300	6.7					2.6	2.7
01	285	6.5						2.7
02	260	6.0						2.8
03	275	5.6						2.8
04	250	5.1						2.7
05	285	4.8						2.7
06	290	5.4	260			E		2.8
07	240	9.1	230		120	2.1		3.2
08	230	11.2	220		110	2.9	3.2	3.2
09	240	13.0	220		110	3.3	3.6	3.1
10	250	13.2	220		110	3.6	4.0	3.1
11	290	13.8	230		110		4.4	2.9
12	290	14.0	230		105		5.3	2.9
13	290	14.5	235		110		(5.2)	2.9
14	290	14.8	230		110		(5.0)	2.9
15	290	14.2	230		110	3.4	4.3	2.9
16	260	13.6	230		110	3.1	3.6	3.0
17	250	13.4	240		110	2.5	4.1	3.0
18	230	12.2			110	1.9	3.9	3.1
19	220	10.9					3.6	3.0
20	240	9.0					3.6	2.9
21	250	8.5					3.6	2.9
22	255	7.7					2.8	2.8
23	290	6.9					2.6	2.7

Time: 135.0°E.
Sweep: 1.2 Mc to 18.5 Mc in 15 minutes, manual operation.

Table 28

Nanking, China (32.1°N, 119.0°E) October 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00								
01								
02								
03								
04								
05	260	4.3					2.0	2.7
06	280	5.7					2.0	2.7
07	250	9.9	240		130	2.3	2.7	3.0
08	240	12.4	240		125	3.0	4.0	2.9
09	260	12.8	240		120	3.4	4.0	3.0
10	260	14.0	240		120	3.7	4.2	2.8
11	280	14.5	240		120	4.0	4.4	2.8
12	280	14.5	240	6.2	120	4.0	4.1	2.7
13	295	14.5	240	6.4	120	4.0	4.0	2.7
14	280	14.6	240	6.0	120	3.9	4.0	2.8
15	260	14.5	235		120	3.6	3.8	2.8
16	250	14.5	240		120	3.1	3.7	2.8
17	250	13.8	240		120	2.6	3.5	2.9
18	230	12.3					3.1	2.8
19	240	11.0					2.1	2.7
20	240	10.4					2.2	2.8
21	240	9.0					2.9	2.7
22	240	8.2					2.0	2.7
23								

Time: 120.0°E.
Sweep: 1.7 Mc to 15.0 Mc in 15 minutes, manual operation.

Table 29

Chungking, China (29.4°N, 106.8°E) October 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	250	8.0					2.6	2.8
01	240	7.1					2.6	2.8
02	240	6.2						2.7
03	260	5.2						2.7
04	260	4.2						2.7
05	290	4.3						2.6
06	250	5.8						2.8
07	240	10.2	220		110	2.5	4.1	3.3
08	235	11.8	220		100	3.2	4.4	3.0
09	240	13.0	220		100	3.4	5.0	3.0
10	250	13.6	210		100	3.7	4.9	2.9
11	260	14.6	200				4.8	2.8
12	280	16.0	200	6.8	100	4.0	4.8	2.6
13	300	17.3	220	6.6	110	3.8	4.5	2.6
14	300	17.0	230		120	3.8	4.5	2.7
15	250	17.0	220		90	3.5	4.5	2.8
16	240	17.0	240		100	3.2	4.0	2.9
17	240	16.7	230		100	2.7	4.2	2.9
18	230	15.0					3.6	2.8
19	225	14.0					3.6	2.8
20	220	12.7					4.2	2.7
21	230	11.4					3.7	2.8
22	245	9.8					3.1	2.7
23	240	9.0					3.0	2.8

Time: 105.0°E.
Sweep: 1.5 Mc to 20.0 Mc in 15 minutes, manual operation.

Table 30

Rarotonga I. (21.3°S, 159.8°W) October 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00								
01								
02								
03								
04								
05								
06	275	10.3	265			1.9	2.8	2.9
07	250	11.7	250		110	2.6	3.2	3.1
08	250	12.2	240	6.6	110	3.2	4.3	3.0
09	290	12.7	240	6.6	110	3.4	4.2	2.8
10	300	13.4	230	6.5	110	3.7	5.2	2.7
11	300	14.3	250	7.1	110	3.7	5.1	2.7
12	330	14.7	250	6.7	110	3.8	5.1	2.7
13	340	14.5	250	7.1	110	3.8	4.4	2.7
14	350	14.2	250	6.7	110	3.7	4.5	2.7
15	350	13.8	250	6.6	110	3.6	4.3	2.6
16	340	13.6	250	6.4	110	3.3	4.0	2.7
17	310	13.7	260	6.5	110	2.7	3.6	2.7
18	290	13.0	280	6.9		2.1	3.5	2.7
19								
20								
21								
22								
23								

Time: 157.5°W.
Sweep: 2.0 Mc to 16.0 Mc, manual operation.

Table 31

Brisbane, Australia (27.5°S, 153.0°E) October 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	270	7.6					2.1	2.8
01	250	7.5					2.1	2.7
02	250	6.9					2.5	2.7
03	260	6.6					2.1	2.7
04	270	6.6						2.8
05	280	6.5			140	1.6		2.8
06	250	8.5			110	2.5		3.1
07	230	10.0			100	3.0		3.1
08	240	10.5	220		100	3.4		3.1
09	260	11.2	220	5.0	100	3.6		3.0
10	260	11.2	210	5.0	100	3.7		2.9
11	270	11.4	210	5.2	100	3.8		2.9
12	275	11.5	210	5.0	100	3.9		2.8
13	275	11.2	210	5.0	100	3.9		2.8
14	260	11.0	210	5.0	100	3.8		2.8
15	250	10.4	220	4.9	110	3.5		2.8
16	240	10.1			110	3.3		2.9
17	250	10.0			110	2.5		2.9
18	245	9.8					3.2	3.0
19	250	9.0					2.6	2.9
20	260	8.7						2.9
21	260	8.7					2.0	2.8
22	260	8.5					2.1	2.8
23	260	8.0					2.1	2.8

Time: 150.0°E.
Sweep: 1.0 Mc to 16.0 Mc in 1 minute 55 seconds.

Table 32

Watheroo, W. Australia (30.3°S, 115.9°E) October 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	290	6.2					3.0	2.7
01	262	6.0					3.0	2.7
02	280	5.4					3.0	2.6
03	290	5.0					3.0	2.5
04	295	4.8					3.0	2.6
05	305	4.8					3.1	2.6
06	270	6.1				2.2	3.0	3.0
07	252	7.6	250	4.2		2.8	3.2	3.1
08	282	8.6	240	4.8		3.2	3.4	2.9
09	300	9.4	235	5.0		3.5	3.9	2.8
10	300	10.0	220	5.3		3.6	4.1	2.8
11	320	10.3	225	5.4		3.6	4.3	2.7
12	328	10.8	230	5.2		3.7	4.4	2.7
13	[illegible]	10.9	230	5.5		3.8	4.4	2.7
14	320	10.7	230	5.4		3.6	4.0	2.6
15	318	10.4	240	5.0		3.3	4.0	2.6
16	255	10.1	245	4.8		3.1	3.5	2.7
17	260	10.3				2.6	3.6	2.7
18	260	9.9					3.1	2.8
19	240	9.0					2.8	2.8
20	250	8.2					2.7	2.8
21	265	7.1					2.8	2.7
22	280	7.0					2.8	2.7
23	290	6.7					3.0	2.6

Time: 120.0°E.
Sweep: 16.0 Mc to 0.5 Mc in 15 minutes, automatic operation.

Table 33

Canberra, Australia (35.3°S, 149.0°E) October 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	280	6.8					2.7	2.6
01	280	6.6					3.0	2.5
02	260	6.2					2.6	2.5
03	280	5.8					2.4	2.5
04	275	5.4					2.2	2.5
05	285	5.4			135	1.5		2.6
06	250	6.0			110	2.2	2.9	3.0
07	250	7.1	250	4.4	100	2.9	3.4	2.9
08	250	7.4	240	4.6	100	3.2		2.9
09	290	8.2	220	5.0	100	3.5		2.8
10	300	9.1	210	5.0	100	3.6		2.8
11	300	9.4	200	5.2	100	3.7		2.7
12	300	10.1	200	5.2	100	3.8		2.7
13	300	9.4	200	5.2	100	3.8		2.7
14	300	9.5	205	5.0	100	3.6		2.7
15	240	9.1	220	5.2	100	3.5		2.7
16	240	9.0			100	3.2		2.7
17	250	9.0			100	2.7	3.2	2.8
18	250	8.7			120	2.0	3.2	2.8
19	250	8.8						2.7
20	250	8.1					2.0	2.6
21	270	7.6					2.8	2.6
22	270	7.5					2.5	2.6
23	280	7.1					2.7	2.6

Time: 150.0°E.
Sweep: 1.0 Mc to 16.0 Mc in 1 minute 55 seconds.

Table 34

Hobart, Tasmania (42.8°S, 147.4°E) October 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	300	5.3					2.0	2.7
01	300	4.8					1.7	2.7
02	295	4.6					2.0	(2.9)
03	300	3.7					2.3	(2.8)
04	300	3.4					2.0	(2.7)
05	300	3.7			100	1.6	2.0	2.8
06	270	4.8			100	2.2		2.9
07	270	5.6	250	4.1	100	2.7		3.0
08	335	6.0	250	4.5	100	3.1		2.8
09	380	6.5	230	4.8	100	3.4		2.8
10	370	7.2	220	4.9	100	3.5		2.7
11	380	7.2	200	5.0	100	3.7		2.8
12	350	7.6	210	5.0	100	3.7		2.8
13	360	8.0	220	5.1	100	3.7		2.7
14	330	8.3	220	5.0	100	3.5		2.8
15	335	8.2	230	5.0	100	3.4		2.8
16	300	8.1	240	4.8	100	3.2		2.8
17	255	8.4	250	4.5	100	2.7		2.8
18	260	8.5			100	2.0		2.9
19	250	8.2			125	1.5		2.9
20	240	7.7					2.2	2.8
21	250	7.0					2.6	2.8
22	270	6.2					1.8	2.8
23	295	5.8						2.7

Time: 150.0°E.
Sweep: 1.0 Mc to 13.0 Mc in 1 minute 55 seconds.

Table 35

Christchurch, New Zealand (43.5°S, 172.7°E) October 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	300	6.4					2.6	2.4
01	310	6.0					2.8	2.5
02	300	5.5					2.7	2.5
03	290	5.1					2.6	2.5
04	290	4.5					2.6	2.7
05	290	4.2				1.2	2.7	2.8
06	270	5.5				1.9	2.8	2.8
07	250	6.2	250	4.3		2.8		2.9
08	300	6.8	240	4.7		3.2		2.9
09	330	7.8	230	4.8		3.4		2.9
10	310	8.3	230	5.2		3.5		2.8
11	315	8.7	220	5.2		3.6		2.8
12	300	8.8	235	5.3		3.6		2.7
13	290	9.3	230	5.2		3.6		2.8
14	260	9.1	230	5.0		3.5		2.8
15	255	9.0	240	4.8		3.4		2.8
16	250	8.8	240	4.3		3.0		2.7
17	260	8.8				2.6		2.7
18	270	8.9				1.5	2.7	2.7
19	260	9.0					2.6	2.6
20	270	8.5					2.5	2.6
21	280	7.9						2.6
22	280	7.4						2.5
23	290	7.0					2.6	2.4

Time: 172.5°E.
Sweep: 1.0 Mc to 13.0 Mc.

Table 36

Lanchow, China (36.1°N, 103.8°E) September 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00	360	7.2					3.0	2.4
01	360	7.0					3.0	2.3
02	360	7.1					2.7	2.3
03	360	7.0						2.3
04	360	6.6						2.3
05	375	6.4						2.3
06	340	7.2						2.5
07	325	9.0	300		155	3.2	3.9	2.7
08	340	10.8	300		150	3.2	4.4	2.7
09	335	10.8	285	5.4	140	3.4	4.6	2.6
10	350	11.5	280	5.9	130	3.7	4.6	2.5
11	380	12.6	280	6.0			4.6	2.4
12	380	13.0	280				4.6	2.5
13	380	12.9	280				4.5	2.4
14	380	12.8	280	6.4			4.7	2.4
15	380	13.0	290	5.9	140	3.6	4.4	2.4
16	360	12.8	300		140	3.2	4.1	2.4
17	340	12.5	310		140	3.0	4.0	2.5
18	340	11.7	300				4.1	2.6
19	320	10.5					3.8	2.5
20	(290)	(10.0)					3.6	(2.6)
21	320	8.7					3.2	2.5
22	340	7.8					3.3	2.3
23	360	7.4						2.3

Time: 105.0°E.
Sweep: 2.4 Mc to 16.0 Mc in 15 minutes, manual operation.

Table 37

Nanking, China (32.1°N, 119.0°E) September 1948

Time	h'F2	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000
00								
01								
02								
03								
04	260	5.6					(1.9)	(2.7)
05	260	5.8					1.9	2.7
06	260	7.8					2.2	2.8
07	255	9.7	240		130	2.7	3.3	3.0
08	250	10.7	240		120	3.0	4.0	3.0
09	260	10.5	240		120	3.7	4.4	2.9
10	280	11.0	240		120	4.0	4.0	2.7
11	300	12.5	240	5.6	120	4.0	4.2	2.6
12	320	13.3	235	5.8	120	4.0		2.6
13	330	13.5	240	6.0	120	4.0	4.2	2.5
14	320	13.3	240	6.0	120	4.0		2.6
15	320	13.6	240	5.8	120	3.7	4.2	2.6
16	285	13.6	240	4.9	120	3.4	3.9	2.6
17	280	13.1	245		120	3.1	3.8	2.7
18	280	12.2	250				3.1	2.8
19	225	10.9					2.1	2.8
20	240	9.6					2.1	2.7
21	260	8.8					2.1	2.5
22								
23								

Time: 120.0°E.
Sweep: 1.5 Mc to 20.0 Mc in 15 minutes, manual operation.

Table 38

Delhi, India (28.6°N, 77.1°E) September 1948

Time	*	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000**
00	450	7.4						2.5
01	440	6.9						
02	460	6.5						
03	440							
04	440	5.8						2.5
05	400	5.4						
06	360	7.5						
07	360	9.9						
08	360	11.0						2.7
09	380	11.2						
10	440	12.0						
11	440	13.0						
12	440	13.2						
13	440	13.5						
14	430	13.6						
15	440	13.8						
16	410	13.6						2.4
17	410	13.3						
18								
19								
20	440	10.4						2.6
21	460	9.5						
22	460	8.2						
23	450	7.7						

Time: Local.
Sweep: 1.8 Mc to 16.0 Mc in 5 minutes, manual operation.
*Height at 0.83 foF2.
**Average values; other columns, median values.

Table 39

Bombay, India (19.0°N, 73.0°E) September 1948

Time	*	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000**
00								
01								
02								
03								
04								
05								
06								
07	330	10.6						
08	405	11.2						2.7
09	480	12.5						
10	510	13.2						
11	510	13.8						
12	510	14.6						2.4
13	600	14.5						
14	570	14.7						
15	540	14.8						
16	510	14.5						2.4
17	480	14.8						
18	480	14.5						
19	480	14.2						
20	480	14.0						2.5
21	480	13.5						
22	480	13.2						2.5
23								

Time: Local.
Sweep: 1.8 Mc to 18.0 Mc in 5 minutes, manual operation.
*Height at 0.83 foF2.
**Average values; other columns, median values.

Table 40

Madras, India (13.0°N, 80.2°E) September 1948

Time	*	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000**
00								
01								
02								
03								
04								
05								
06								
07	420	10.2						
08	480	10.8						2.4
09	495	11.4						
10	540	11.8						
11	540	12.0						
12	540	12.2						2.2
13	540	12.1						
14	540	12.2						
15	540	12.8						
16	540	13.0						2.2
17	540	13.0						
18	540	13.1						
19	540	12.5						
20		12.0						2.4
21		11.5						
22		11.0						
23								

Time: Local.
Sweep: 1.8 Mc to 15.0 Mc in 5 minutes, manual operation.
*Height at 0.83 foF2.
**Average values; other columns, median values.

Table 41

Rarotonga I. (21.3°S, 159.8°W) September 1948

Time	h'F2	foF2	h'F1	foF1	h'E	foE	fEs	F2-M3000
00								
01								
02								
03								
04								
05								
06	300	6.5				1.7	2.9	2.7
07	250	10.6			115	2.4	3.2	3.1
08	250	12.2			110	2.9	3.6	3.1
09	260	12.6	240	6.5	110	3.4	3.9	3.1
10	290	13.2	250	6.5	110	3.7	4.2	2.9
11	280	12.6	250	6.0	110	3.8	4.4	2.9
12	300	12.7	240	6.0	110	3.9	4.4	2.8
13	300	12.1	250	6.8	110	3.8	4.6	2.6
14	305	12.2	245	6.5	110	3.7	4.6	2.6
15	345	12.2	250	6.5	110	3.5	4.2	2.7
16	340	12.0	250	6.2	110	3.2	4.3	2.7
17	300	12.0	260	6.4	110	2.7	3.8	2.7
18	290	12.2	280	7.0		2.0	3.5	2.7
19								
20								
21								
22								
23								

Time: 157.5°W.
Sweep: 2.0 Mc to 16.0 Mc, manual operation.

Table 42

Hobart, Tasmania (42.8°S, 147.4°E) September 1948

Time	h'F2	foF2	h'F1	foF1	h'E	foE	fEs	F2-M3000
00	270	4.9					2.1	2.8
01	260	4.7					2.5	2.7
02	275	3.9					2.4	2.6
03	270	3.7					2.4	2.8
04	272	3.5					2.4	2.6
05	280	3.2					2.1	(2.8)
06	290	4.0			100	(1.9)	2.0	(3.0)
07	250	5.5			102	2.2	2.0	3.2
08	250	6.7	220		105	2.8	2.0	3.2
09	260	7.5	220		102	3.2		3.1
10	290	8.6	212	4.7	100	3.3		3.1
11	280	9.2	218	4.7	100	3.5		(3.0)
12	275	10.2	210	4.8	100	3.6	2.0	3.0
13	272	9.8	210	4.8	105	3.5	2.1	3.0
14	270	9.6	210	4.5	105	3.5		3.0
15	250	9.2	205	4.0	100	3.2		3.0
16	242	9.1	220	(3.8)	100	2.9		2.9
17	242	8.7			105	2.3	2.0	3.0
18	242	8.5				(1.9)	2.0	3.0
19	(245)	(8.6)						
20	255	7.1						(2.8)
21	250	6.0						2.9
22	250	5.6					2.0	2.8
23	260	5.2					2.0	2.8

Time: 150.0°E.
Sweep: 1.0 Mc to 13.0 Mc in 1 minute 55 seconds.

Table 43

Delhi, India (28.6°N, 77.1°E) August 1948

Time	*	foF2	h'F1	foF1	h'E	foE	fEs	** F2-M3000
00	460	8.6						2.3
01	440	8.2						
02	440	7.6						
03	440	(7.4)						
04	440	7.0						2.8
05	400	6.6						
06	360	7.5						
07	360	8.8						
08	400	9.4						2.7
09	440	10.0						
10	480	11.3						
11	480	12.2						
12	480	12.6						2.5
13	480	12.9						
14	460	13.0						
15	450	13.0						
16	440	13.0						2.9
17	440	12.8						
18								
19								
20	440	10.4						2.5
21	460	9.6						
22	460	8.8						
23	460	8.3						

Time: Local.
Sweep: 1.8 Mc to 16.0 Mc in 5 minutes, manual operation.
*Height at 0.83 foF2.
**Average values; other columns, median values.

Table 44

Bombay, India (19.0°N, 73.0°E) August 1948

Time	*	foF2	h'F1	foF1	h'E	foE	fEs	** F2-M3000
00	420	(12.4)						2.7
01								
02	360	(9.7)						
03	360	(7.3)						
04	330	(6.0)						2.9
05	300	(5.6)						
06	330	(7.2)						
07	330	9.0						
08	360	10.1						2.8
09	420	11.0						
10	510	11.8						
11	540	13.0						
12	540	13.5						2.3
13	540	14.0						
14	540	14.0						
15	540	14.2						
16	510	14.4						2.4
17	480	14.5						
18	480	14.4						
19	480	13.8						
20	480	13.6						2.4
21	480	13.2						
22	480	12.1						2.4
23	480	12.3						

Time: Local.
Sweep: 1.8 Mc to 16.0 Mc in 5 minutes, manual operation.
*Height at 0.83 foF2.
**Average values; other columns, median values.

Table 45

Madras, India (13.0°N, 80.2°E) August 1948

Time	*	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000**
00								
01								
02								
03								
04								
05								
06								
07	360	8.9						
08	420	10.6						2.5
09	510	11.3						
10	540	11.1						
11	570	10.9						
12	570	11.0						2.2
13	600	10.9						
14	600	11.2						
15	600	11.1						
16	600	11.6						2.2
17	600	11.8						
18	540	11.6						
19	570	11.7						
20	540	11.0						2.2
21	540	10.8						
22	510	10.5						
23								

Time: Local.
Sweep: 1.8 Mc to 16.0 Mc in 5 minutes, manual operation.
*Height at 0.83 foF2.
**Average values; other columns, median values.

Table 46

Delhi, India (28.6°N, 77.1°E) July 1948

Time	*	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000**
00	480	8.9						2.3
01	500	8.6						
02	(480)	8.5						
03	460	8.2						
04	(480)	(7.4)						2.3
05	440	7.5						
06	400	8.2						
07	400	9.0						
08	440	9.2						2.4
09	520	9.8						
10	520	10.7						
11	520	11.8						
12	520	12.3						2.2
13	520	12.8						
14	500	12.8						
15	500	(12.8)						
16	480	(12.6)						2.3
17	480	12.5						
18								
19								
20	480	9.3						2.4
21	500	9.2						
22	500	9.0						
23	520	8.8						

Time: Local.
Sweep: 1.8 Mc to 16.0 Mc in 5 minutes, manual operation.
*Height at 0.83 foF2.
**Average values; other columns, median values.

Table 47

Bombay, India (19.0°N, 73.0°E) July 1948

Time	*	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000**
00	(450)	(7.4)						2.6
01	(420)	(6.9)						
02	(420)	(6.6)						
03	(480)	(5.7)						
04	(480)	(5.6)						2.6
05	(420)	(5.7)						
06	(330)	(7.3)						
07	330	8.8						
08	390	9.7						2.8
09	480	10.4						
10	540	11.3						
11	555	12.0						
12	570	12.8						2.3
13	570	13.2						
14	540	13.5						
15	510	14.0						
16	480	14.2						2.2
17	480	14.4						
18	450	13.6						
19	480	12.8						
20	480	11.8						2.4
21	480	10.3						
22	480	9.5						
23	480	9.0						

Time: Local.
Sweep: 1.8 Mc to 16.0 Mc in 5 minutes, manual operation.
*Height at 0.83 foF2.
**Average values; other columns, median values.

Table 48

Madras, India (13.0°N, 80.2°E) July 1948

Time	*	f°F2	h'F1	f°F1	h'E	f°E	fEs	F2-M3000**
00								
01								
02								
03								
04								
05								
06								
07	420	9.1						
08	480	10.3						2.4
09	540	10.4						
10	600	10.3						
11	600	10.5						
12	600	10.6						2.1
13	600	10.8						
14	600	10.8						
15	600	11.2						
16	600	11.7						2.1
17	600	12.1						
18	600	12.2						
19	570	11.6						
20	540	10.5						2.2
21	480	(9.7)						
22	480	(9.4)						
23								

Time: Local.
Sweep: 1.8 Mc to 16.0 Mc in 5 minutes, manual operation.
*Height at 0.83 foF2.
**Average values; other columns, median values.

Form adopted June 1946

TABLE 49

Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D.C.

IONOSPHERIC DATA

h'F2 (Characteristic), Km (Unit), January (Month), 1949

Observed at Washington, D.C.

Lat. 39.0° N, Long. 77.5° W

75° W Mean Time

National Bureau of Standards (Institution)

Scaled by: E. J. W., J.J.S., J. M.C.

Calculated by: J.J.S., J.L.S.

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	250	250	270	230	250	230	240	250	230	230	230	240	240	240	230	250	230	210	230	210	250	250	280	300
2	280	330	300	260	250	250F	260	270	240	240	220	230	230	230	210	230	240	220	200	220	220	230	250	250
3	270	250	250	250	230	240	260	250	230	230	230	240	240	230	220	230	240	210	230	220	230	250	250	250
4	260	250	250	250	250	250	250	250	220	230	230	230	240	230	230	240	230	230	200	(250)A	230	240	260	290
5	[280]A	280	270	270	250	240	260	230	230	220	230	230	250FH	230	230	230	250	220	220	230	230	240	270	270
6	270	[280]A	(300)A	260	250	260	250	250	240	250	230	230	(240)A	240H	[230]C	230	(230)A	(230)A	(220)A	230	230	250	250	260
7	260	260	310	(350)S	270	260	230	250	220	220	[220]A	230	220	230	230	220	220	220	200	220	210	220	240	250
8	A	A	(290)A	270	260	270	260	240	220	200	230	220	220	250	230	230	230	220	210	230	230	230	(220)A	250
9	250	(300)A	(300)A	250	[270]A	(300)A	260	250	220	220	220	230	250	250	230	230	210	230	210	200	220	230	230	250F
10	(300)A	280	270	250F	270	280	260	260	220	230	220	240	240	230	230	240	230	230	230	200	230	220	250	230
11	270A	290	340	320F	290F	260	250F	250	230	210	230	230	(230)SC	240	230	230	230	210	230	220	(250)S	250	250	(270)S
12	(290)S	300	300	280	(250)S	250	250	240	220	220	220	270	230H	230	230	[230]C	240	210	200	210	240	(250)A	(330)A	(300)A
13	300	290	(270)A	250	250	250	250	250	210	220	220	250	230	250	240	220	210	200	210	220H	220	220	250	260
14	270	290	(250)S	250	250	270	260	240	220	230	230	230	230	240	240	230	230	220	220	(230)A	210	(230)AS	250	260
15	280	280	280	270	260	230	250	[220]A	(200)A	(220)A	(230)A	(230)A	230	220H	240	230	230	230	(230)A	210	210	230	280	280
16	280	280	270	270	270	250	250	250	210	(230)A	220	240	230	240	230	230	230	230	200	200	230	250	250	250
17	250	250	250	230	240	260	260	220	220	230	230	230H	240	(230)A	230	230F	200	210	200	200	220	220	250	(250)A
18	300	300	(280)A	270	230	230	(270)S	230	210	220	210	230	230	230	240	220	230	230	230	200	250	220	250	250
19	250	250	240	250	250	250	230	210	230	210	220	280	230	230	(230)A	(230)A	230	210	200	200	210	(220)S	230	230
20	240	250	250	250	260	270	270	250	220	220	210	270H	230	230	230	220	220	220	210	230	210	220	240	250
21	250	280	290	270	260	250	230	230	210	220	210	260	210	250	230	230	230	220	(210)S	(220)S	210	230	230	230
22	250	300	280	270	250	230	240	230	220	230	220	250	250	240	230	230	230	230	200	220	210	230	250	240
23	250	270	260	240	220	230	250	250	230	220	220	230	240	230	220	230	230	220	210	200	220	210	250	250
24	280	260	250	230	230	230	250	250	220	C	C	C	C	240	250	230	230	220	(250)A	280K	WK	WK	WK	CK
25	CK	350K	(300)FK	(340)FK	400FK	370FK	330FK	330FK	270FK	250HF	240HK	230HK	230HK	350K	240K	280K	(560)BK	WK	400K	(420)FK	WK	300FK	510K	420K
26	270K	290K	320K	300K	250K	(280)FK	240K	260	230	220	220	230	230	250	240	250	230	220	200	250	230	220	240	260
27	280K	300K	300K	300K	300K	(300)AK	300K	260	230	220	230	240	230	200	230	240	220	210	200	200	210	230	250	250
28	270	260	270	280	260	[260]A	(270)A	250	220	220	230	250	240	C	C	230	230	230	210	210	200	240	250	240
29	250	250	(230)S	(230)S	250	260	(280)S	250	230	230	230	210	240	240	230H	220	220	230	230	230	220	220	250	230
30	(250)S	260	250	250	270	260	(280)A	240	220	230	230	230	230	230	230	230	230	220	220	200	210	230	230	250
31	250	250	250	260	250	250	250	240	220	220	210	250	250	240	240	240	230	220	210	230	220	240	250	250
Median	270	280	270	260	250	250	250	250	220	220	225	230	230	235	230	230	230	220	210	220	220	230	250	250
Count	29	30	31	31	31	31	31	31	31	30	30	30	30	30	30	31	31	31	31	31	31	31	31	30

Sweep 1.0 Mc to 25.0 Mc in 0.25 min

Manual ☐ Automatic ☒

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Form adopted June 1946

TABLE 50

Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D.C.

IONOSPHERIC DATA

fo F2 (Characteristic), Mc (Unit), January (Month), 1949

Observed at Washington, D.C.

Lat 39.0°N, Long 77.5° W

75° W Mean Time

National Bureau of Standards (Institution)

Scaled by E. J. W., J.J.S., J. M. C.

Calculated by J.J.S, J.L.S.

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	3.5 F	S(4.0) JF	3.5 F	3.6 F	S(4.0) JF	3.7	3.1 F	(3.5) FS	7.3	8.8	9.8	10.7	11.7	11.4	10.7	11.7	11.5	9.7	8.2	7.5	4.7 F	4.4	(3.7) SF	3.7
2	F S	F S	F S	S(4.1) JF	S(4.8) JF	F S	F S	S(3.9) JF	(7.1) FS	9.3	(11.0) JS	12.0	12.7	11.7	11.3	10.7	10.8	(10.2) JS	9.0	7.7	(6.0) JS	4.8	4.3	(3.9) JS
3	(3.9) FS	(3.9) FS	4.2 F	4.2	S(4.4) JF	3.3 F	2.9 F	(3.6) SF	6.5	8.7	9.7	10.7	12.0	10.6	10.2	[10.5] S	(10.8) J	9.0	7.7	(6.5) J	5.4	(4.2) J	4.0	(3.9) JS
4	4.0	(3.9) S	3.4 F	3.2 F	3.4	3.1 F	3.0	(3.6) J	6.6	8.2	9.5	10.6	11.0	11.5	10.6	10.6	10.8	(10.2) P	7.4	(6.2) P	(5.6) S	(4.1) SP	(3.5) S	(3.6) S
5	[3.6] A	3.5	3.5	3.5	3.6	(3.5) S	(2.7) P	3.1 F	7.3	8.5	9.0	9.6	11.4	11.3	(10.8) S	(10.8) JP	(11.3) JS	(9.6) P	7.7	6.6	(5.0) S	(4.2) J	4.6 F	4.4
6	4.2	[4.0] A	4.2	(4.4) S	(5.2) J	(4.0) J	3.8	4.3	8.1	9.5	10.2	(11.9) S	(12.2) JS	12.0	[12.0] C	(12.0) S	(11.4) JS	S	C	(7.5)	[6.2] C	(5.0)	(4.9) S	(4.9) S
7	(4.9) S	(4.3) J	(4.1) JS	(4.3) JS	(5.3) S	(5.2)	(5.1)	[5.2] CS	(7.1) JS	9.6	11.4	12.6	11.8	12.6	12.4	11.6	(10.9) JS	(10.7) SP	(9.1) SP	(7.7)	5.9	(5.1) JS	(4.9) S	4.7
8	(4.0) A	(3.7) A	3.5 F	3.5 F	3.7 FV	3.7 FV	3.7 F	3.9	7.7	8.7	10.5	11.8	12.2	12.0	11.8	12.2	11.8	(10.7) JS	(9.6) S	(7.5) GP	(6.6) S	5.7	4.7	(5.5) FS
9	(4.5) JS	[4.6] SF	(4.8) FS	(5.0) S	[4.5] AS	S(4.1) JF	(3.9) SF	S(4.1) JF	7.1	9.0	10.2	12.3	12.3	12.5	12.2	11.5	(11.6) S	(11.6) S	(11.0) JS	(8.3) SP	(7.4) S	(6.4) JS	4.7 F	(3.7) FS
10	3.8	(3.9) JS	S(3.9) JF	[3.6] SF	3.3 F	3.4 F	3.1 F	3.7 FS	(6.9) JS	10.0	10.7	12.0	12.5	12.0	11.6	(12.0) S	11.5	(10.5) SP	(9.1) SP	8.1	6.7	(5.0) FS	[4.5] SF	(4.3) JS
11	3.1 F	3.0 F	(2.6) FS	3.0 F	3.1 F	3.5 SF	3.1 F	S(4.1) JF	(7.6) S	(8.8) S	11.4	11.8	(12.0) S	(12.0) MS	11.5 M	(11.4) S	(10.6) J	(9.7) SP	C	C	(4.9)	(4.4)	(3.9) S	(3.8) S
12	(3.3) S	[3.5] CS	(3.7) J	(4.1) JS	(4.2) JS	(4.1) JS	(4.1) JS	(4.1) JS	7.9	9.2	10.3	12.7	(12.0) J	(11.8) S	10.7	[10.8] C	(11.0)	(10.9) JS	(9.7) S	(7.9) S	5.7	(4.7) F	(3.1) FS	(3.1) F
13	3.9	(4.1) JS	4.3	3.9 F	3.5 F	3.5 F	3.1 F	3.9 F	6.9	8.9	10.1	11.3	12.0	12.2	11.5	(10.9) JS	(10.6) JS	(9.3) SP	(9.5) SP	(7.4) SP	(6.2) S	4.7	3.7	3.4
14	3.2	3.1 F	3.3 F	3.6 F	S(3.6) JF	2.9 F	2.9 F	(3.8) FS	7.0	9.4	10.7	11.0	11.7	11.6	11.6	11.4	(10.7) S	(9.8) JS	8.4	6.8	5.7	4.8	(4.3) S	(3.9) S
15	3.7	3.9 F	3.9 F	(3.9) FS	(4.1) JS	(3.7) FS	(3.9) FS	(4.7) A	7.5	9.6	10.8	11.5	(11.7) S	11.7	11.5	11.4	11.0	(10.7) JS	8.8	(7.7) S	(6.2) S	(4.5) JS	4.7	(4.6) FS
16	4.5	4.7	4.6	4.6	4.3	(4.1) FS	4.4	4.6 F	7.8	9.7	10.8	11.8	12.6	12.3	11.8	11.7	11.6	11.5	(9.4) S	8.5	6.6	5.8	(5.1) JS	5.2
17	(5.1) S	(5.4) S	5.5	5.0	4.2	3.9	(4.1) G	4.8	8.2	10.0	(11.6) G	11.8	12.3	11.9	11.1	(11.5) G	(11.4) S	(10.0) JS	(9.4) G	(8.2) JS	7.0	6.1	(6.0) S	5.5
18	5.4	5.4	5.5	5.5	5.5	4.7 F	3.9 F	4.5 F	7.7	9.8	10.8	11.8	12.4	12.1	11.6	(11.6) S	(11.6) S	11.6	11.6	(9.4) SP	8.8	7.7	6.6	5.3 F
19	4.9 F	5.8 F	5.5 F	5.4	5.3 F	5.1	(4.9) JS	4.7	8.7	(10.2) JS	11.0	12.0	12.5	12.0	12.2	11.5	(11.0) JS	(10.8) S	(9.5) SP	8.5	7.3	(6.7) JS	6.1	5.3
20	4.8 F	4.8 F	3.9 F	3.1 F	3.1 F	2.9 F	2.8 F	3.9 F	7.7	9.4	(10.4) J	(11.8) J	13.0	12.2	11.7	11.4	11.2	(10.8) J	9.3	8.6	7.4	6.0	(5.5) S	S(5.1) JF
21	5.0 F	(4.4) FS	(4.7) FS	4.7 F	(4.8) F	(4.7) F	4.7	(4.6) FS	7.8	10.2	11.4	13.2	12.2	12.2	11.5	11.5	11.5	(10.6) JS	(10.4) S	9.6	(7.6) JS	(6.7) J	6.0	5.5
22	5.1	5.0	5.3	5.2	4.9 F	4.9 F	3.9 F	4.4 F	8.4	10.1	11.5	12.8	12.4	12.3	12.7	12.4	11.5	(10.9) JS	(9.4) S	8.4	7.0	5.9	(5.6) JS	5.3
23	4.9	4.9	4.9 F	4.9 F	4.5 F	3.7 F	3.4 F	4.7 F	7.8	10.5	11.1	12.2	(12.5) JS	12.2	(12.4) SP	12.0	12.0	11.4	(10.7) JS	8.4	7.5	(6.0) S	5.9	5.3
24	5.8	5.9	5.9	5.7	(4.5) JS	3.7 F	3.1 F	4.5 F	7.9	C	C	C	C	13.0	12.5	10.8	11.7	(11.8) J	(11.2) JS	8.0 K	W K	W K	W K	C K
25	C K	4.0 FK	3.3 FK	3.9 FK	3.1 FK	3.1 FK	3.2 FK	3.7 FK	K(5.1) FS	5.9 FK	6.3 FK	7.3 FK	7.6 FK	8.9 K	10.6 K	(12.0) JK	W K	W K	3.3 FK	F K	W K	K(4.0) FS	(3.2) FK	N FK
26	3.4 FK	(3.5) FK	(2.9) FK	3.6 FK	3.5 FK	2.9 FK	[2.8] FK	4.9 F	7.7	9.4	11.7	12.9	12.6	13.4	12.9	13.4	(12.2) J	11.8	[10.2] S	8.5	(6.4) P	5.4	4.5	3.9
27	2.6 FK	2.7 FK	2.6 FK	2.4 FK	2.3 FK	2.2 FK	2.3 FK	3.4 F	6.8	8.3	10.0	11.7	11.8	(11.4) J	(10.5)	(10.9) JS	(11.0) J	(10.6) SP	8.7	(7.5) J	(6.6) G	4.8	4.5	F(4.1) JS
28	3.9 F	3.9	3.6 F	3.5 F	3.3	3.3	3.1 F	4.1 F	7.6	9.2	10.3	11.6	11.5	C	C	11.8	11.4	10.3	9.5	8.5	6.7	5.6	5.5	4.9
29	5.1	4.9 F	4.9	3.8	3.3	3.2	2.9 F	4.3	7.6	9.3	9.8	11.4	11.8	11.6	10.9	11.2	(10.8) SP	(10.6) JS	(9.5) SP	8.9	7.3	5.7	5.4	4.9
30	4.5	4.4	4.3	3.8	3.6	3.7	3.5	4.7	7.9	9.8	10.3	12.0	11.8	11.0	10.8	(11.7) S	11.6	9.6	(9.5) SP	(8.4) JS	6.9	5.6	5.2	4.9
31	4.5	(4.1) JS	3.9	3.9 F	4.0	4.1	S(4.0) JF	4.6 F	8.2	9.8	11.0	12.0	12.2	11.5	11.2	11.4	10.7	(10.2) P	9.6	(8.0) J	(7.2) J	5.7	5.4	4.9
Median	4.2	4.1	4.0	3.9	4.0	3.7	3.3	4.1	7.6	9.4	10.6	11.8	12.1	12.0	11.5	11.5	11.3	(10.6)	(9.4)	8.0	6.6	5.1	4.7	4.7
Count	29	30	30	31	31	30	30	31	31	30	30	30	30	30	30	31	31	30	29	29	31	31	31	29

Sweep 1.0 Mc to 25.0 Mc in 0.25 min

Manual ☐ Automatic ☒

TABLE 51

Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D.C.

Form adopted June 1946

IONOSPHERIC DATA

foF2 (Characteristic), Mc (Unit), January (Month), 1949

Observed at Washington, D.C.

Lat 39.0°N, Long 77.5° W

75° W Mean Time

National Bureau of Standards (Institution)

Scaled by: E.J.W. J.J.S. J.M.C.

Calculated by: J.J.S. , J.L.S.

Day	0030	0130	0230	0330	0430	0530	0630	0730	0830	0930	1030	1130	1230	1330	1430	1530	1630	1730	1830	1930	2030	2130	2230	2330
1	J(4.1)FS	J(3.9)SF	3.6F	3.7	J(4.1)FS	(3.5)SF	2.9F	5.4	7.4F	9.4	10.6	11.1	11.8	11.7	11.0	11.4	9.9	8.7	7.9	J(4.9)FS	4.3F	(4.1)JS	3.5	(3.7)FS
2	FS	FS	(3.1)FS	(4.8)FS	(4.7)FS	FS	FS	(5.4)FS	7.5	10.8	11.6	12.0	12.0	(11.3)S	11.2	(10.7)JS	(10.8)S	(9.5)S	(8.0)JS	6.9	5.6	4.4	4.4	(3.9)S
3	4.2	(4.1)FS	4.3F	4.1F	3.6	3.1F	2.9F	(5.5)FS	7.6	[9.1]C	9.7	12.0	10.7	10.3	10.0	(11.0)J	[9.9]S	(8.0)J	7.0	6.2	4.6	4.3	4.0	4.0
4	(3.9)S	3.8	(3.7)P	(3.4)S	(3.2)SC	3.0F	2.8F	(6.1)P	8.4	9.0	9.8	11.0	11.4	10.8	10.6	10.7	10.4	(9.2)P	6.5	6.2	5.0	3.7	3.6	3.6
5	3.6	3.5	3.5	3.6	(3.9)P	3.1F	2.7	5.5	8.0	8.9	9.3	10.7	11.5	(10.5)J	10.7	(11.0)S	[10.4]C	(9.4)SP	7.0	6.6	5.0F	(4.2)J	4.4	(4.5)J
6	(4.0)JS	(4.1)J	(4.4)J	4.3	4.3	(3.8)P	3.9	5.5	9.1	10.0	(11.9)S	(11.3)S	12.0	11.6	11.7	11.8	S	S	C	C	C	[5.0]S	(4.9)S	(4.8)S
7	(4.4)JS	(4.2)JS	(4.4)JS	[5.1]CS	(5.2)	[5.2]CS	[5.1]CS	5.3	(8.1)	(10.2)P	12.4	12.2	12.6	(12.6)P	11.5	11.5	S	S	8.6	6.8	5.9	(5.1)JS	4.7	4.5
8	3.8	3.5F	3.5F	3.5F	3.7FV	3.5F	3.7	(6.1)S	8.4	9.2	11.3	11.6	12.3	11.9	12.4	12.2	(10.9)JS	(10.3)S	8.6	[7.0]SC	(6.1)S	5.7	(5.1)JS	4.9F
9	[4.8]SF	J(4.8)FS	4.7	[4.4]SF	(4.1)SF	(3.9)SF	[4.0]F	5.9F	8.8F	10.0	11.5	12.5	11.8	11.8	12.0	(12.3)JS	11.5	(11.6)S	S(9.7)CP	(8.4)SP	(6.3)JS	(5.5)S	J(4.0)FS	(3.7)FS
10	3.6F	3.8FS	J(4.1)FS	(3.2)F	3.3F	3.3F	3.0F	5.9	9.2	10.6	11.6	12.3	11.9	11.8	11.8	11.5	(11.0)JS	(9.9)JS	(8.8)SP	(6.7)SP	(6.1)S	(4.5)JS	F(4.5)JS	(3.7)FS
11	3.0F	(2.6)FS	2.7F	3.1F	3.3FS	3.1F	3.3F	5.9	8.8	(10.8)J	(11.4)J	(13.0)S	(12.0)HS	(12.4)JS	[11.4]C	(10.9)J	(10.6)JS	S	C	CS	(5.0)J	J(4.3)CS	(3.5)CS	(3.1)S
12	(3.5)	[3.8]CS	(4.0)JS	(4.2)JS	[4.2]CS	(4.1)JS	(4.0)JS	5.9	8.4	(9.9)J	10.7	(13.0)S	(12.6)JS	(10.8)JS	[10.8]C	(10.8)JS	(10.9)JS	(10.8)JS	9.1	J(6.5)SP	5.2	[3.8]FS	3.2F	3.4F
13	3.9FS	[4.2]FS	(4.2)FS	3.7F	(3.5)FS	3.2F	2.9F	5.7FS	7.6	9.5	10.7	11.8	(12.6)S	11.5	11.7	11.0	(11.1)JS	(9.4)SP	8.8	(6.7)SP	5.4	3.9	3.7	(3.2)JS
14	(3.1)F	3.1F	3.6F	J(3.9)SF	(3.3)SF	2.9F	J(3.7)FS	(5.6)F	8.1	10.2	10.7	11.2	11.8	11.7	11.5	[10.7]S	9.8	(9.9)JS	(6.8)S	[6.3]S	4.9	(4.1)JS	(3.7)F	(3.9)FS
15	3.9F	3.9F	3.9F	(3.9)FS	(3.9)FS	(3.9)FS	J(4.1)FS	6.1	9.2	10.4	11.3	11.7	12.3	11.2	11.5	(11.0)S	(10.8)JS	(9.7)SP	8.1	(6.9)JS	5.2	(4.3)FS	(4.7)FS	(4.4)S
16	4.7	4.6	4.6	4.4	4.2F	4.1F	3.9	6.3	9.3	10.8	11.6	12.5	12.3	12.0	(11.8)S	11.7	11.6	(10.7)JS	9.0	7.5	5.9	5.9	(5.1)JS	5.3
17	5.4	5.5	5.3	4.5	4.0	3.9	(4.1)S	6.1	8.8	10.8	12.0	11.8	(12.0)S	(11.0)JS	11.4	11.7	(10.7)JS	(10.0)JS	8.4	7.5	6.8	6.0	5.9	5.7
18	5.4	5.5	5.7	(5.6)JS	(5.1)FS	4.2F	(4.1)JS	6.2	8.8	10.4	11.8	12.4	12.4	12.4	11.9	(11.5)SC	11.4	(11.6)JS	(11.0)SC	8.5	8.0	6.7	5.6	5.7
19	5.2F	5.7	(5.5)JS	5.4F	5.3	4.9	(4.4)S	6.3	9.3	(11.2)CP	10.8F	12.7	12.8	12.5	11.5	(11.4)S	(11.1)S	(10.8)S	8.8	7.9	6.9	(6.5)JS	5.7	4.9
20	4.7F	J(4.5)FS	3.5F	3.1F	3.0F	2.8F	2.9F	5.9	8.7	10.1	(11.1)J	(12.9)J	13.0	(11.4)S	11.8	11.0	(11.0)J	(9.9)JS	8.9	8.0	6.5	(5.7)S	(5.0)S	5.2
21	(4.7)FS	(4.7)FS	J(4.6)FS	(4.7)FS	4.8F	4.7	(3.9)FS	(6.7)FS	9.4	10.4	11.7	12.5	12.0	12.0	11.7	11.8	(11.0)JS	(10.8)JS	9.3	9.0	7.5	(6.2)JS	5.4	5.3
22	5.3	(5.1)S	5.0	5.0	4.9F	4.7F	3.9F	6.5	8.9	11.0	11.3	12.0	(12.8)JS	12.5	(12.6)J	11.7	(11.3)S	(10.5)JS	(8.6)S	(8.0)J	(6.2)JS	(5.6)JS	(5.6)S	4.9F
23	4.9	4.9	4.9F	4.7F	3.9F	3.5F	3.6F	6.1	9.5	10.6	11.5	12.0	12.0	12.0	(12.7)JS	(12.2)JS	11.7	(11.0)JS	10.3	8.0	7.1	(6.1)JS	(5.5)FS	5.5
24	5.7	5.8	5.9	5.1	4.3	3.3F	3.1F	6.1	9.4	C	C	C	12.4	12.5	11.8	(10.8)JS	12.0	11.7	(10.2)JS	5.6FK	WK	WK	WK	CK
25	FK	3.8FK	(3.9)FK	[3.5]WK	3.1FK	3.3FK	3.5FK	4.6FK	5.2FK	6.1FK	7.1FK	7.0K	J(7.8)FK	10.0K	11.0K	(11.9)JK	WK	NWK	3.3FK	WK	WK	[3.6]FK	FK	WK
26	(3.9)FK	[3.0]FK	[3.2]FK	(3.5)FK	[3.2]FK	2.9FK	2.8FK	6.9F	(9.5)SP	10.5	12.5	12.9	13.0	13.6	13.4	(13.0)J	11.5	11.5	[8.6]S	6.8	5.5	4.5F	4.3F	3.4F
27	2.7FK	2.6FK	2.5FK	2.3FK	2.2FK	2.2FK	2.4FK	5.5	7.8	9.0	11.6	11.2	11.5	10.8	(10.7)J	11.7	(10.8)S	9.0	8.7	7.3	(5.3)FS	4.7F	(4.4)S	3.9F
28	3.9F	3.7F	3.5F	3.3F	3.4F	3.3F	3.1	6.0	8.4	9.6	10.8	11.7	C	C	11.5	11.6	10.7	9.7	8.9	7.7	5.9	5.5	5.3	5.0
29	4.9F	4.9	4.4	3.6	3.2	2.9	3.0	5.9	8.5	9.6	10.5	11.5	11.6	10.8	10.9	(11.2)S	(11.7)JS	9.5	9.0	(7.9)J	6.5	5.4	5.4	4.7
30	4.4	4.4	4.2	3.7	3.6	3.6	3.5F	5.9	9.4	10.0	10.8	11.5	11.6	10.8	11.3	11.6	(10.0)JS	(9.9)JS	9.3	7.5	(6.1)JS	5.5	4.9	(4.7)J
31	4.3	(4.0)JS	4.0	J(4.1)FS	(4.1)JS	3.9F	3.9F	6.5F	8.9	10.0	11.7	12.2	12.2	11.5	11.5	11.3	10.2	(9.7)P	8.3	(8.2)J	6.6	(5.6)J	4.9	5.2
Median	4.2	4.1	4.1	3.9	3.9	3.5	3.6	5.9	8.8	10.0	11.3	12.0	12.0	11.6	11.5	11.5	(10.9)	(9.9)	8.7	7.0	5.9	5.0	4.7	4.5
Count	29	30	31	31	31	30	30	31	31	30	30	30	30	30	31	31	29	27	29	29	30	31	30	30

Sweep 1.0 Mc to 25.0 Mc in 0.25 min

Manual ☐ Automatic ☒

TABLE 52

Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D.C.

IONOSPHERIC DATA

Form adopted June 1946

h'F1 (Characteristic), Km (Unit), January (Month), 1949

Observed at Washington, D.C.

Lat 39.0°N, Long 77.5°W

75° W Mean Time

National Bureau of Standards (Institution)

Scaled by: E. J.W. J.J.S., J. M.C.

Calculated by: J.J.S., J.L.S.

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1											210			230		220								
2													210	210										
3												220	230	200										
4																								
5													230	230										
6										220	220		230	230										
7																								
8											210	200		210	210	220 H								
9													(220)	210	210									
10												220	(220)	220	(220)	230								
11												210		210	200	220								
12												220			200	C								
13												220		230	220									
14												220	220	220	220	220								
15															220									
16												200	200	230										
17													220			200								
18												210		210	220									
19												220												
20												200		210	200									
21												220		210	210	200								
22												220	200	220										
23													210	210										
24														200	210									
25										Q K	Q K	Q K	Q K	240 K	Q K	Q K								
26												210	210	220	220	230	220							
27											200	200	200	240	200	220								
28											210	210	210	C	C									
29											210		230	210	210									
30													210		210									
31												230	200	210	210									
Median											210	220	210	210	210	220								
Count											6	17	17	23	17	9								

Sweep 1.0 Mc to 25.0 Mc in 0.25 min

Manual ☐ Automatic ☒

TABLE 53

Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D. C.

Form adopted June 1946

IONOSPHERIC DATA

foF1 (Characteristic), Mc (Unit), January (Month), 1949

Observed at Washington, D.C.

Lat. 39.0°N, Long. 77.5° W

75° W Mean Time

National Bureau of Standards (Institution)

Scaled by: E. J. W., J.J.S., J. M. C.

Calculated by: J.J.S., J. L. S.

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1											L			L		L								
2													L	L										
3												L	L	L										
4																								
5													L	L										
6										L	L		L	L										
7																								
8											L	L		L	L	L								
9													L	L	L									
10												L	L	L	L	L								
11												L		L	L	L								
12												L			L	C								
13												L		L	L									
14												L	L	L	L	L								
15															L									
16												L	L	L										
17													L			L								
18												L		L	L									
19												L												
20												L		L	L									
21												L		L	L	L								
22												L	L	L										
23													L	L										
24														L	L									
25										Q K	Q K	Q K	Q K	5.0 K	Q K	Q K								
26												L	L	L	L	L	L							
27											L	L	L	L	L	L								
28											L	L	L	C	C									
29											L		L	L	L H									
30													L		L									
31												L	L	L	L									
Median																								
Count																								

Sweep 1.0 Mc to 25.0 Mc in 0.25 min

Manual ☐ Automatic ☒

U. S. GOVERNMENT PRINTING OFFICE 1946 O - 702319

TABLE 54

Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D.C.

IONOSPHERIC DATA

h'E (Characteristic), Km (Unit), January (Month), 1949

Observed at Washington, D.C.

Lat 39.0°N, Long 77.5° W

75° W Mean Time

National Bureau of Standards (Institution)

Scaled by E.J.W., J.J.S., J.M.C.

Calculated by J.J.S., J.L.S.

Form adopted June 1946

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1									(120)S	110	(110)A	110	A	110	110	100	110							
2									110	110	(110)A	100	100	100	100	100	110							
3									110F	110	100	100	100	100	100	120	A							
4									(140)SC	120	110	110	110	110	110	(130)A	(130)A							
5									(150)A	A	(100)A	A	(100)A	110	100	110	120							
6									140	A	100	100	100	100	C	A	A							
7									110	120	110	110	110	110	110	(110)A	(110)A							
8									(130)S	110	(100)A	A	A	(120)A	110	110	120							
9									100	A	110	100	110	100	A	100	120							
10									140	100	110F	100	(110)B	110	100	110	110							
11									A	100	100	(100)A	(100)S	100	110	100	120							
12									130	110	100	(100)A	100	100	100	C	110							
13									130	110	100	100	100	100	100	100	110							
14									150	(120)A	(110)AS	(110)A	(100)A	100	100	100	(130)A	A S						
15									A	A	A	A	A	A	A	A	A	A						
16									A	A	A	(100)A	100	100	100	(110)A	100							
17									130	100	(100)A	(100)A	(120)A	A	A	A	100							
18									(130)A	A	(110)A	(110)A	100	100	100	100	110	(130)S						
19									130	100	100	100	100	100	100	100	(110)A	150						
20									(130)S	100	100	100	100	100	100	100	110	130						
21									100	100	100	100	100	100	100	100	120	(130)S						
22									110	100	100	(100)A	100	100	100	100	100	130						
23									130	100	100	100	100	100	120	100	100							
24									(130)S	C	C	C	C	(100)A	(100)A	100	100							
25									120K	110K	100K	100K	100K	100K	100K	100K	EK							
26									120	110	100	100	100	100	100	100	110							
27									130	110	100	100	(130)A	B	(120)B	100	110							
28									A	A	(110)S	110	110	C	C	100	100							
29									100	100	100	(110)A	100	100	110	(130)B	(110)A	120						
30									A	A	100	100	100	100	100	100	(110)A							
31									140	100	100	100	100	100	100	B	120							
Median									130	110	100	100	100	100	100	100	110	130						
Count									26	22	28	27	27	27	26	26	27	6						

Sweep 1.0 Mc to 25.0 Mc in 0.25 min

Manual ☐ Automatic ☒

TABLE 55

Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D.C.

Form adopted June 1946

IONOSPHERIC DATA

f_oE (Characteristic), Mc (Unit), January (Month), 1949

Observed at Washington, D.C.

Lat 39.0° N, Long 77.5° W

75° W Mean Time

National Bureau of Standards (Institution)

Scaled by: E. J.W. J.J.S., J. M. C.

Calculated by: J.J.S., J. L. S.

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1									2.1 H	(2.5) S	3.0 H	(3.3) FH	[3.4] A	3.4	3.1	2.8	1.9							
2									2.2	2.5	(3.0) A	3.2	3.2	(3.3) H	3.1	2.5	2.1							
3									2.1 F	2.7 F	3.0	3.2	3.3	3.3 H	3.1	(2.6)	C							
4									1.9	2.8	3.0	3.2	3.3	3.2	[3.0] A	2.9	A							
5									1.9 H	[2.6] A	3.2 F	3.3	3.3	3.3	3.1	[2.6] C	2.1 H							
6									1.9	2.5 H	3.0 F	[3.0] A	(3.1) A	(3.0) A	C	A	A							
7									C	A	2.9	3.1	3.2	3.3	[3.1] A	2.9	2.5							
8									2.0 H	2.5	[2.9] A	3.3	[3.3] A	3.3	3.1	2.9	2.5							
9									A	A	3.0	3.3 F	[3.4] C	3.4	3.2	2.9	S							
10									2.0 HF	2.7	3.1	3.3	3.3	3.5	3.4	2.9	2.3							
11									A	(2.6) S	3.1	3.3	3.4 H	3.4	3.2	3.0	2.5							
12									1.9 H	2.8	3.1 H	[3.4] A	3.6	3.4	3.3	[2.8] C	(2.4) S							
13									2.3	[2.7] A	3.1	3.4 F	3.5	3.5	3.3	2.9	A							
14									1.9 H	2.7 H	3.1 H	3.4	3.5	3.4	3.2	2.7	2.6	2.0						
15									A	A	A	A	A	3.6	A	A	(2.5) AS	2.3						
16									A	A	A	(3.4) A	3.6	3.6	3.3	3.1	2.6							
17									2.3 H	3.1	3.5	3.7	3.8	A	A	(3.3) A	2.7							
18									2.2 H	(2.7) A	3.2	3.4	3.4	3.3	3.1	3.0	2.7	(1.9) FS						
19									2.1	2.9 H	3.1 H	3.4	3.5	3.6	(3.2) A	[3.0] A	(2.7) S	2.1						
20									2.3	2.7 H	3.1	3.4	3.5	3.5	(3.4) A	3.1	2.8	2.1						
21									A	2.8 H	3.2	A	A	3.5	(3.4) A	3.1	2.7	2.0						
22									2.4 H	A	A	3.4	3.5	3.6 H	3.3	3.1	2.7	2.0						
23									2.3	2.8 H	3.2	3.4	3.4	[3.4] A	3.3	3.3	2.8							
24									2.4	C	C	C	C	3.6	3.4	3.1	2.7							
25									2.2 HK	2.7 FK	3.1 K	3.3 K	3.4 K	3.4 K	3.3 K	3.2 K	B K							
26									2.3	2.8	3.2	(3.4) S	3.4	3.4	3.1	3.0	S							
27									2.1	2.8	3.2	[3.4] A	3.5	[3.4] B	3.4 B	3.1	2.6							
28									2.4 H	(2.8) A	3.3	3.4	3.5	C	C	3.0	A							
29									A H	2.9	A	A	(3.5) A	3.3	3.2	3.1	(2.7) A	1.9						
30									(2.3) H	[2.7] A	3.1	3.4	3.6	3.5	3.2	3.2	2.7							
31									2.4 H	2.7 H	3.1	3.4	3.3	3.4	3.3	[3.0] B	2.8							
Median									2.2	2.7	3.1	3.4	3.4	3.4	3.2	3.0	2.6	2.0						
Count									24	25	26	27	28	29	27	29	23	8						

Sweep 1.0 Mc to 25.0 Mc in 0.25 min

Manual ☐ Automatic ☒

U. S. GOVERNMENT PRINTING OFFICE 1946 O - 702519

Form adopted June 1946

TABLE 56

Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D.C

IONOSPHERIC DATA

Es (Characteristic), Mc,Km (Unit) January (Month), 1949

Observed at Washington, D.C.

Lat 39.0° N, Long 77.5° W

75° W Mean Time

National Bureau of Standards (Institution)

Scaled by E.J.W. J.J.S., J.M.C.

Calculated by J.J.S., J.L.S.

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	G	G	G	G	G	G	G	G	G	G	3.3 120	G	4.3 120	G	G	G	G	2.0 110	1.9 100	G	G	G	G	G
2	G	G	G	G	G	G	G	G	G	2.7 130	3.2 110	G	G	G	G	3.2 120	2.4 120	G	2.0 100	G	G	G	G	G
3	G	G	G	G	3.6 100	G	G	G	G	G	3.5 100	G	G	G	3.3 120	2.0 100	2.0 100	G	G	G	G	G	G	G
4	G	G	G	G	G	G	G	G	G	G	G	5.2 130	3.6 130	G	3.2 120	3.4 110	2.4 110	2.0 100	1.9 100	2.4 100	1.9 100	2.0 100	G	2.9 120
5	5.8 100	G	3.2 110	2.0 100	3.2 100	2.2 110	1.9 110	G	2.0 110	4.4 100	3.3 100	3.1 100	2.8 100	2.0 90	3.3 120	G	1.9 110	6.8 110	2.2 120	3.1 100	1.8 100	2.0 100	3.5 100	2.3 110
6	3.6 110	5.6 100	5.2 100	3.5 110	3.5 110	G	2.2 110	3.5 130	G	2.3 100	3.2 110	5.0 110	6.2 110	3.3 110	C	3.7 100	4.4 100	3.6 100	3.4 100	3.6 100	G	G	G	G
7	G	2.7 100	G	G	3.0 100	3.2 100	G	G	G	2.8 120	9.8 110	4.8 110	6.0 110	3.9 Y 100	3.6 110	3.1 100	2.3 100	3.1 100	G	G	G	2.3 110	G	5.1 100
8	5.4 100	5.9 100	4.3 100	2.7 100	G	G	1.9 100	G	G	G	3.1 100	3.4 110	3.3 100	2.7 100	G	G	G	G	G	2.4 100	3.0 100	2.3 100	3.5 100	1.9 100
9	3.7 100	3.7 100	5.9 100	5.0 100	5.9 100	3.9 100	3.8 100	3.4 100	2.4 100	2.7 110	G	G	G	G	2.9 100	G	G	2.3 100	G	3.0 100	G	G	G	G
10	6.1 100	G	G	G	G	2.8 100	3.4 100	3.7 100	G	G	G	G	G	G	G	3.2 120	2.6 110	G	G	G	2.0 100	G	3.0 130	3.8 110
11	3.9 120	4.3 110	5.9 110	4.5 100	3.9 100	3.9 100	G	3.5 100	2.3 100	G	G	2.4 100	2.1 100	G	G	G	G	G	G	G	2.3 120	G	G	2.3 120
12	G	G	G	G	G	G	G	G	G	G	G	3.7 100	G	G	3.5 130	C	G	G	G	G	G	3.1 130	3.9 120	4.7 110
13	5.0 110	4.0 100	7.6 100	4.5 100	G	G	G	G	G	3.7 110	G	G	G	G	G	4.3 100	4.8 100	6.1 100	2.0 100	3.4 100	3.0 100	G	G	G
14	G	2.4 100	2.2 110	3.8 110	3.1 100	3.9 100	3.8 100	2.7 100	3.9 120	2.3 100	3.8 100	3.3 100	2.7 100	G	3.7 120	2.9 110	2.4 100	2.2 100	G	3.8 100	3.0 100	2.4 100	3.3 100	G
15	G	5.2 100	6.0 100	2.8 100	3.3 100	2.4 100	6.4 100	7.3 100	4.8 100	4.5 100	5.0 100	6.0 100	6.1 100	7.0 100	4.5 100	3.4 100	3.1 100	3.2 100	5.2 100	2.4 100	G	G	G	G
16	G	G	G	G	G	3.8 110	G	G	3.7 100	6.3 100	3.7 100	4.2 110	G	G	G	2.4 100	G	2.3 100	G	G	G	G	G	G
17	G	G	G	G	G	G	G	G	G	G	3.7 110	3.6 100	3.8 100	7.3 100	7.0 100	5.0 100	4.2 90	4.9 100	2.3 100	G	1.9 100	2.9 90	3.4 100	G
18	3.4 100	4.4 100	4.4 100	3.8 100	G	G	G	3.6 110	2.9 100	3.9 90	3.8 100	2.7 100	G	G	G	G	G	G	G	2.2 100	G	G	G	G
19	G	G	G	G	3.5 110	G	G	G	G	G	4.0 110	3.9 130	8.0 110	4.9 110	6.4 100	4.4 100	2.3 100	G	G	G	G	G	G	G
20	G	G	G	G	G	G	3.5 100	G	G	G	G	G	G	12.5 110	G	G	2.0 90	2.0 100	G	G	G	G	G	G
21	G	G	G	G	G	G	G	G	2.3 100	G	G	5.6 120	5.5 100	3.8 100	3.6 100	3.8 100	G	G	G	G	G	G	G	1.9 100
22	G	G	G	G	G	G	G	G	2.3 130	4.7 100	3.9 100	3.3 100	G	3.7 100	G	G	G	G	3.2 100	2.0 100	2.4 90	G	G	G
23	G	3.5 100	4.4 100	3.8 100	3.1 100	2.0 110	G	G	G	G	G	G	G	3.8 100	G	G	G	2.0 90	2.7 90	G	G	2.3 90	G	G
24	G	3.3 110	G	G	G	G	G	G	G	C	C	C	C	3.8 100	3.8 100	G	G	4.6 100	7.2 90	4.8 90	3.7 110	G	G	C
25	C	2.8 120	2.0 100	2.3 100	2.3 130	G	G	G	G	G	G	G	G	G	G	G	G	4.6 130	3.9 F 120	4.0 F 120	5.0 100	2.4 F 150	2.5 F 100	2.6 F 100
26	4.0 150	3.8 Y 100	G	G	G	G	G	G	G	G	3.9 90	G	3.9 90	G	3.5 130	G	G	G	G	G	G	G	G	G
27	G	G	G	G	G	3.2 100	2.9 Y 100	G	G	G	G	3.4 100	3.0 100	G	G	G	G	2.0 110	G	G	2.3 100	2.4 100	1.9 100	2.7 100
28	2.0 100	3.9 100	3.2 90	G	G	4.0 100	7.2 100	G	3.5 100	3.5 Y 100	2.3 100	G	G	C	C	3.3 100	2.8 100	1.9 130	G	G	3.2 Y 120	2.7 Y 100	2.4 Y 100	G
29	G	G	G	G	G	G	4.3 100	3.3 100	3.9 100	G	3.5 110	3.7 110	3.9 110	3.7 110	3.5 130	3.6 Y 120	3.0 110	G	4.3 100	2.4 100	4.1 100	3.2 100	G	2.2 100
30	2.9 100	2.1 100	G	G	G	G	6.6 100	2.9 100	4.0 Y 100	5.6 100	G	G	G	G	G	G	2.2 100	1.9 100	G	G	G	G	G	G
31	G	G	G	G	G	G	2.0 120	G	G	G	G	G	G	G	G	G	G	2.0 100	G	G	G	3.2 100	3.2 100	G
Median	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	3.2	2.9	* *	* *	X X	* *	1.9	2.0	* *	* *	* *	* *	* *	* *
Count	30	31	31	31	31	31	31	31	31	30	30	30	30	30	29	30	31	31	31	31	31	31	31	30

* * MEDIAN fEs LESS THAN MEDIAN foE, OR LESS THAN LO' ER FREQUENCY LIMIT OF RECORDER.

Sweep 1.0 Mc to 25.0 Mc in 0.25 min

Manual ☐ Automatic ☒

U. S. GOVERNMENT PRINTING OFFICE

Form adopted June 1946

TABLE 57

Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D. C.

IONOSPHERIC DATA

National Bureau of Standards (Institution)

(M1500)F2 (Characteristic) ____ (Unit) January (Month), 1949

Observed at Washington, D. C.

Lat 39.0°N, Long 77.5°W

75°W Mean Time

Scaled by: E. J. W., J.J.S., J.M.C.

Calculated by: J.J.S., J. L. S.

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	1.9F	F(2.0)JS	2.0F	2.0F	F(1.9)JS	2.1	2.2F	(2.1)FS	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.1	2.1	2.3	2.1	2.3	1.9F	2.0	(1.8)SF	1.7
2	FS	FS	FS	F(1.8)JS	F(1.9)JS	FS	FS	F(2.0)JS	(2.1)FS	2.1	F(2.2)JS	2.1	2.1	2.1	2.1	2.1	2.2	(2.1)JS	2.1	2.1	(2.2)JS	2.1	1.9	(1.9)JS
3	(1.9)FS	(1.9)FS	1.9F	2.0	F(1.9)JS	1.9F	2.0F	(1.9)SF	2.3	2.3	2.4	2.1	2.3	2.1	2.1	S	(2.2)J	2.1	2.1	(2.0)J	2.2	(2.0)J	2.0	(2.1)JS
4	2.1	(1.9)S	2.0F	2.0F	2.2	2.2F	2.0	(1.7)J	2.3	2.4	2.4	2.1	2.2	2.2	2.2	2.1	2.1	(2.0)P	2.2	(2.1)P	(2.2)S	(2.1)SP	(1.9)S	(1.9)S
5	A	1.9	2.1	2.1	2.1	(2.0)S	(2.1)P	2.1F	2.4	2.4	2.3	2.2	2.1	2.2	(2.1)S	(2.1)JP	(2.2)JS	(2.1)P	2.3	2.1	(2.0)S	(2.1)J	1.9F	2.0
6	2.0	A	1.9	(2.0)S	(1.6)J	(2.0)J	2.1	2.1	2.3	2.3	2.2	(2.3)S	(2.2)JS	2.2	C	(2.2)S	(2.4)JS	SC	C	(2.2)	CS	(2.1)S	(2.1)S	(2.0)
7	(2.0)S	(1.9)JS	(1.8)JS	(1.7)JS	(1.9)S	(2.0)	(2.3)	CS	(2.4)JS	2.2	2.2	2.2	2.2	2.2	2.0	2.1	(2.2)JS	(2.2)SP	(2.2)SP	(2.3)	2.0	(2.1)JS	(2.2)S	2.0
8	(2.1)A	(2.1)A	2.0F	1.9F	2.0FV	1.9FV	2.1	2.2	2.4	2.3	2.3	2.1	2.1	2.1	2.1	2.0	2.1	(2.2)JS	(2.3)S	(2.1)SP	(2.1)S	2.1	2.0	(2.0)FS
9	(2.0)JS	SF	(1.9)FS	(2.1)S	SA	F(1.8)JS	(1.9)SF	F(2.0)JS	2.4	2.2	2.3	2.2	2.2	2.1	2.0	2.0	(2.0)S	(2.2)S	(2.2)JS	(2.3)SP	(2.3)S	(2.3)JS	2.1F	(2.0)FS
10	2.0	(1.9)JS	F(2.0)JS	SF	1.8F	1.8F	2.2F	2.0FS	(2.3)JS	2.5	2.3	2.2	2.2	2.1	2.2	(2.3)S	2.2	(2.1)SP	(2.2)SP	2.2	2.2	(2.2)FS	SF	(2.3)JS
11	1.9F	1.7F	(1.9)FS	1.7F	1.9F	2.0SF	2.1F	J(2.0)FS	(2.3)S	(2.1)S	2.2	2.2	(2.5)S	(2.1)JJ	2.1H	(2.1)S	(2.1)J	(2.3)SP	C	CS	(2.0)	1.9	(2.1)S	(2.1)S
12	(1.9)S	CS	(1.9)J	(1.9)JS	(1.9)JS	(2.1)JS	(2.0)JS	(2.1)JS	2.3	2.2	2.2	2.1	(2.2)J	(2.0)S	2.1	C	(2.2)JS	(2.2)JS	(2.2)S	(2.2)S	1.9	(1.9)F	(1.9)FS	(1.9)F
13	1.7	(1.9)JS	2.0	1.9F	1.9F	1.9F	2.1F	2.0F	2.4	2.2	2.2	2.1	2.1	2.2	2.2	(2.1)JS	(2.1)JS	(2.2)SP	(2.1)SP	(2.0)SP	(2.3)S	2.3	2.0	2.0
14	1.9	1.9F	2.0F	2.2F	F(2.1)JS	1.9F	2.0F	(2.0)FS	2.3	2.4	2.2	2.1	2.1	2.1	2.1	2.1	(2.2)S	(2.1)JS	2.2	2.2	2.1	2.0	(2.1)S	(2.0)S
15	1.8	1.9F	1.9F	(2.0)SF	(2.0)FS	(2.0)FS	1.9FS	(2.0)A	2.3	2.3	2.3	2.2	(2.0)S	2.1	2.0	2.1	2.1	(2.1)JS	2.2	(2.1)S	(2.1)S	(1.9)JS	1.8	(1.8)FS
16	1.8	1.9	1.8	1.8	1.8	(1.9)FS	1.9	1.9F	2.2	2.3	2.2	2.1	2.1	2.0	2.0	2.0	2.1	2.0	(2.0)S	2.1	2.1	2.0	(2.0)JS	1.4
17	(1.9)S	(1.9)S	2.0	2.0	1.9	1.9	(1.9)S	2.0	2.4	2.4	(2.2)S	2.2	2.2	2.2	2.1	(2.0)S	(2.1)S	(2.3)JS	(2.0)S	(2.1)JS	2.0	2.0	(1.9)S	1.9
18	1.7	1.7	1.9	2.0	2.1	1.9F	1.9F	2.0F	2.3	2.3	2.1	2.1	2.0	2.0	2.0	(2.0)S	(2.0)S	2.1	2.1	(2.2)SP	2.0	2.0	1.9	1.9F
19	2.0F	1.9F	1.9F	1.9	1.9F	2.0	(2.1)JS	2.2	2.3	(2.3)JS	2.3	2.1	2.0	2.0	2.0	2.0	(2.1)JS	(2.0)S	(2.1)SP	2.1	2.1	(2.0)JS	2.1	2.0
20	2.0F	2.0F	2.0F	1.9F	1.8F	1.8F	1.9F	1.9F	2.3	2.2	(2.2)J	(2.1)J	2.1	2.1	2.0	2.0	2.0	(2.1)J	2.0	2.1	2.1	2.0	(2.1)S	F(2.0)JS
21	1.9F	(1.8)FS	(1.7)FS	1.8F	(1.8)F	(1.9)F	2.1	(2.1)FS	2.3	2.3	2.2	2.1	2.0	2.1	2.0	2.0	2.0	(2.1)JS	(2.1)S	2.0	(2.2)JS	(2.1)JS	2.2	1.8
22	1.9	1.8	1.8	2.0	1.9F	2.0F	2.1F	2.0F	2.3	2.2	2.2	2.2	2.1	2.0	2.1	2.0	2.1	(2.0)JS	(2.0)S	2.1	2.1	2.0	(2.0)JS	2.1
23	2.0	1.9	1.9F	2.0F	2.1F	2.0F	2.0F	2.0F	2.3	2.4	2.2	2.0	(2.2)JS	1.9	(2.0)SP	2.1	2.0	2.0	(2.1)JS	2.1	2.0	(2.0)S	2.0	1.8
24	1.9	1.8	2.0	2.0	(2.0)FS	2.1F	2.1F	2.0F	2.2	C	C	C	C	2.1	2.0	1.9	1.9	(2.1)J	K(2.1)JS	1.9K	WK	WK	WK	CK
25	CK	1.7FK	1.9FK	1.6FK	1.6FK	1.7FK	1.7FK	2.0FK	F(2.2)KS	1.9FK	1.9FK	2.1FK	1.8FK	1.7K	1.7K	(1.5)JK	WK	WK	1.6FK	FK	WK	K(1.8)FS	(1.4)FK	NFK
26	1.9K	(1.9)FK	(1.8)FK	2.0FK	2.1FK	2.1FK	FK	(2.0)FS	2.3	2.2	2.2	2.1	2.1	2.1	2.0	2.1	(2.1)J	2.1	S	2.0	(2.0)P	2.1	2.1	1.9
27	1.9FK	1.9FK	1.8FK	1.9FK	1.9FK	2.1FK	2.1FK	2.1F	2.5	2.4	2.3	2.4	2.1	(2.2)J	(2.2)	(2.1)JS	(2.1)J	(2.2)SP	2.1	(2.3)J	(2.1)S	2.0	2.4	F(2.0)JS
28	2.0F	2.0F	1.9F	1.8F	1.9	1.8	1.9F	2.0F	2.3	2.2	2.3	2.2	2.1	C	C	2.1	2.1	2.2	2.1	2.1	2.0	2.0	2.0	1.9
29	2.0	2.0F	2.0	2.0	1.9	1.9	2.0F	2.0	2.4	2.4	2.3	2.2	2.1	2.0	2.1	2.1	(2.1)SP	(2.1)JS	(2.1)SP	2.2	2.2	2.0	2.0	2.2
30	1.9	2.0	2.1	2.0	1.9	1.9	2.0	2.0	2.3	2.4	2.4	2.2	2.1	2.2	2.1	(2.1)S	2.1	(2.1)	(2.2)SP	(2.1)JS	2.1	2.1	2.0	2.0
31	2.0	(2.0)JS	2.0	1.9F	2.0	1.9	F(2.0)JS	2.0F	2.4	2.5	2.0	2.2	2.1	2.2	2.1	2.0	2.1	(2.1)P	2.1	(2.1)J	(2.2)J	2.0	1.9	2.0
Median	1.9	1.9	1.9	2.0	1.9	1.9	2.0	2.0	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0
Count	28	27	30	30	30	30	29	30	31	30	30	30	30	30	29	29	31	30	28	29	30	31	30	29

Sweep 1.0 Mc to 25.0 Mc in 0.25 min

Manual ☐ Automatic ☒

Form adopted June 1946

TABLE 58

Central Radio Propagation Laboratory, National Bureau of Standards Washington 25, D.C.

IONOSPHERIC DATA

(M3000)F2 (Characteristic) (Unit) January (Month), 1949

Observed at Washington, D.C.

Lat 39.0°N, Long 77.5° W

75°W Mean Time

National Bureau of Standards (Institution)

Scaled by E.J.W., J.J.S., J.M.C.

Calculated by J.J.S., J.L.S.

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	2.9F	S(3.0)JF	3.0F	3.3F	S(2.9)JF	3.1	3.2F	(3.1)FS	3.3	3.4	3.4	3.3	3.2	3.2	3.2	3.2	3.0	3.2	3.2	3.4	2.7F	2.9	(2.6)SF	2.5
2	FS	FS	FS	S(2.7)JF	S(2.9)JF	FS	FS	S(3.0)JF	(3.2)FS	3.1	S(3.0)JF	3.1	3.1	3.1	3.1	3.1	3.2	(3.2)JS	3.1	3.1	(3.2)JS	3.2	2.9	(2.8)JS
3	(2.8)FS	(2.8)FS	2.7F	2.9	S(2.9)JF	3.1F	3.0F	(2.8)SF	3.4	3.4	3.4	3.1	3.3	3.1	3.0	S	(3.2)J	3.0	3.1	(2.9)J	3.2	(3.0)J	2.9	(3.2)JS
4	3.3	(2.9)S	3.1F	3.1F	3.2	3.4F	3.0	(3.1)J	3.5	3.5	3.4	3.1	3.2	3.1	3.0	3.1	3.1	(3.0)P	3.1	(3.1)P	(3.2)S	(3.1)SP	(2.9)S	(2.8)S
5	A	2.9	3.0	3.1	3.1	(3.0)S	(3.3)P	3.1F	3.4	3.5	3.3	3.2	3.1	3.2	(3.1)S	(3.1)JP	(3.1)JS	(3.2)P	3.2	3.2	(3.1)S	(3.2)J	2.9F	3.0
6	2.9	A	3.0	(3.0)S	(2.4)J	(3.1)J	3.2	3.1	3.3	3.3	3.1	(3.2)S	(3.2)JS	3.2	C	(3.2)S	(3.3)JS	S	C	(3.1)	C	(3.1)S	(3.1)S	(3.0)S
7	(3.0)S	(2.8)JS	(2.8)JS	(2.6)JS	(2.8)S	(2.9)	(3.3)	C	(3.4)JS	3.3	3.2	3.3	3.2	3.2	3.0	3.1	(3.2)JS	(3.3)SP	(3.3)SP	(3.3)	3.1	(3.1)JS	(3.2)S	2.7
8	(3.1)A	(3.0)A	2.9F	2.9F	2.9FV	3.0V	3.1F	3.5	3.3	3.3	3.2	3.1	3.1	3.1	3.1	3.0	3.2	(3.1)JS	(3.3)S	(3.2)SP	(3.2)S	3.2	2.9	(3.0)FS
9	(3.0)JS	SF	(2.8)SF	(3.1)S	SA	S(2.7)JF	(2.9)SF	S(3.0)JF	3.3	3.2	3.3	3.2	3.2	3.1	3.0	3.0	(3.0)S	(3.2)S	(3.2)JS	(3.3)SP	(3.3)S	(3.4)JS	3.1F	(2.9)FS
10	2.9	(2.8)JS	S(3.0)JF	SF	2.7F	2.7F	3.2F	3.0FS	(3.4)JS	3.5	3.3	3.2	3.2	3.1	3.2	(3.3)S	3.1	(3.1)SP	(3.3)SP	3.3	3.3	(3.2)FS	SF	(3.3)JS
11	2.8F	2.7F	(2.9)FS	2.6F	2.9F	2.9FS	3.0F	S(2.9)JF	(3.3)S	(3.2)S	3.2	3.3	(3.4)S	(3.1)HF	3.1H	(3.1)S	(3.1)J	(3.2)SP	C	C	(3.0)	(2.9)	(3.1)S	(3.0)S
12	(2.9)S	C	(2.9)J	(2.9)JS	(2.9)JS	(3.1)JS	(3.0)JS	(3.1)JS	3.4	3.3	3.3	3.1	(3.2)J	(3.0)S	3.0	C	(3.2)JS	(3.2)JS	(3.2)S	(3.2)S	2.8	(2.8)F	(2.7)FS	(2.7)F
13	2.6	(2.8)JS	3.0	2.9F	2.9F	2.9F	3.0F	3.0F	3.4	3.4	3.2	3.1	3.1	3.2	3.1	(3.1)JS	(3.1)JS	(3.2)SP	(3.1)SP	(3.0)SP	(3.2)S	3.3	2.9	2.9
14	2.9	2.8F	3.0F	3.2F	S(3.1)JF	2.9F	3.0F	(2.9)FS	3.4	3.4	3.3	3.2	3.1	3.0	3.1	3.1	(3.2)S	(3.1)JS	3.3	3.1	3.0	3.0	(3.3)S	(2.9)S
15	2.8	2.8F	2.8F	(3.0)FS	(3.0)FS	(3.0)FS	(2.8)FS	(3.0)A	3.3	3.3	3.4	3.1	(3.0)S	3.1	3.0	3.1	3.1	(3.0)JS	3.1	(3.1)S	(3.0)S	(2.9)JS	2.7	(2.7)FS
16	2.7	2.8	2.7	2.7	2.7	(2.7)FS	2.8	2.7F	3.2	3.2	3.2	3.2	3.0	2.9	3.0	3.0	3.0	3.0	(3.1)S	3.1	3.0	3.1	(3.1)JS	2.8
17	(2.9)S	(2.8)S	3.0	3.0	2.8	2.8	(2.9)S	3.0	3.5	3.4	(3.2)S	3.2	3.1	3.2	3.0	(3.0)S	(3.1)S	(3.3)JS	(2.9)S	(3.1)JS	3.0	2.9	(2.8)S	2.9
18	2.6	2.6	2.9	2.9	3.1	2.8F	2.8F	3.1F	3.3	3.4	3.0	3.1	3.0	3.0	3.0	(3.0)S	(3.0)S	3.0	3.0	(3.3)SP	3.0	3.1	2.9	2.8F
19	3.0F	2.8F	2.9F	2.8	2.9F	2.9	(3.0)JS	3.2	3.4	(3.3)JS	3.3	3.1	3.0	2.9	2.9	3.1	(3.0)JS	(3.0)S	(3.2)SP	3.1	3.1	(3.0)JS	3.0	2.9
20	2.9F	3.0F	3.0F	2.9F	2.8F	2.7F	2.9F	3.0F	3.5	3.2	(3.2)J	(3.0)J	3.0	3.1	2.9	3.0	3.0	(3.1)J	3.1	3.1	3.1	3.0	(3.1)S	S(2.9)JF
21	2.8F	(2.7)FS	(2.6)FS	2.8F	(2.8)F	(2.8)F	3.2	(3.0)FS	3.3	3.2	3.2	3.0	2.9	3.1	2.9	3.0	3.0	(3.1)JS	(3.0)S	3.0	(3.3)JS	(3.1)JS	3.1	2.8
22	2.8	2.6	2.7	2.7	2.9F	2.9F	3.1F	3.0F	3.4	3.2	3.1	3.1	3.1	3.0	3.0	2.9	3.1	(3.1)JS	(3.1)S	3.1	3.0	2.9	(2.9)JS	3.1
23	3.0	3.0	3.0F	3.0F	3.1F	3.0F	2.9F	3.0F	3.5	3.3	3.2	3.0	(3.1)JS	2.9	(2.9)SP	3.0	3.0	3.0	(3.1)JS	3.1	3.0	(3.0)S	2.9	2.8
24	2.8	2.7	3.0	3.0	(3.0)FS	3.0F	3.0F	3.1F	3.2	C	C	C	C	3.0	2.9	2.8	2.9	(3.0)J	(3.0)JS	2.8K	WK	WK	WK	CK
25	CK	2.5FK	2.8FK	2.4FK	2.4FK	2.6FK	2.6FK	2.9FK	K(3.1)FS	2.9FK	2.9FK	3.1FK	2.7FK	2.5K	2.5K	(2.3)JK	WK	WK	2.5FK	FK	WK	K(2.8)FS	(2.3)FK	NFK
26	2.8FK	(2.9)FK	(2.7)FK	3.0FK	3.1FK	3.0FK	FK	(3.0)FS	3.4	3.2	3.2	3.1	3.1	3.0	3.0	3.0	(3.0)J	3.1	S	2.9	(3.0)P	3.1	3.1	2.8
27	2.7FK	2.8FK	2.7FK	2.8FK	2.8FK	3.0FK	3.0FK	3.0F	3.5	3.3	3.4	3.2	3.0	(3.1)J	(3.3)	(3.0)JS	(3.1)J	(3.2)SP	3.1	(3.3)J	(3.0)S	3.0	3.5	S(3.1)JF
28	3.0F	3.0F	2.9F	2.8F	2.8	2.7	2.9F	3.0F	3.4	3.3	3.3	3.2	3.1	C	C	3.1	3.1	3.2	3.1	3.1	3.0	3.0	2.9	2.9
29	3.0	3.1F	3.0	3.0	2.9	2.9	2.9F	3.0	3.5	3.4	3.4	3.2	3.1	3.0	3.0	3.1	(3.1)SP	(3.1)JS	(3.2)SP	3.3	3.3	3.0	3.0	3.2
30	2.9	3.0	3.0	3.0	2.8	2.8	3.0	3.0	3.4	3.5	3.4	3.2	3.1	3.2	3.0	(3.1)S	3.0	(3.1)	(3.3)SP	(3.2)JS	3.2	3.1	2.9	3.1
31	3.1	(2.9)JS	2.9	2.8F	3.0	2.9	S(3.0)JF	3.0F	3.4	3.5	3.1	3.2	3.1	3.1	3.1	3.1	3.1	(3.0)P	3.1	(3.2)J	(3.2)J	3.1	2.9	3.1
Median	2.9	2.8	2.9	2.9	2.9	2.9	3.0	3.0	3.4	3.3	3.2	3.2	3.1	3.1	3.0	3.1	3.1	3.1	3.1	3.1	3.0	3.0	2.9	2.9
Count	28	27	30	30	30	30	29	30	31	30	30	30	30	30	29	29	31	30	28	29	30	31	30	29

Sweep 1.0 Mc to 25.0 Mc in 0.25 min

Manual ☐ Automatic ☒

Form adopted June 1946

TABLE 59

Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D.C.

IONOSPHERIC DATA

(M3000)F1 (Characteristic), ____ (Unit), January (Month), 1949

Observed at Washington, D.C.

Lat. 39.0°N, Long 77.5° W

75° W Mean Time

National Bureau of Standards (Institution)

Scaled by: E. J. W. J.J.S., J. M.C.

Calculated by: J.J.S., J. L. S.

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
1											L			L		L										
2													L	L												
3												L	L	L												
4													L	L												
5																										
6										L	L		L	L												
7																										
8											L	L		L	L	L										
9													L	L	L											
10												L	L	L	L	L										
11												L		L	L	L										
12												L			L	C										
13												L		L	L											
14												L	L	L	L	L										
15															L											
16												L	L	L												
17													L			L										
18												L		L	L											
19												L														
20												L		L	L											
21												L		L	L	L										
22												L	L	L												
23													L	L												
24														L	L											
25										Q K	Q K	Q K	Q K	32 K	Q K	Q K										
26												L	L	L	L	L	L									
27											L	L	L	L	L	L										
28											L	L	L	C	C											
29											L		L	L	L H											
30													L		L											
31												L	L	L	L											
Median																										
Count																										

Sweep 1.0 Mc to 25.0 Mc in 0.25 min

Manual ☐ Automatic ☒

U. S. GOVERNMENT PRINTING OFFICE 1146 O 702519

Form adopted June 1946

TABLE 60

Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D. C.

IONOSPHERIC DATA

(M1500) E (Characteristic), ____ (Unit), January (Month), 1949

Observed at Washington, D. C.

Lat 39.0° N, Long 77.5° W

75° W Mean Time

National Bureau of Standards (Institution)

Scaled by: E. J. W. J. M. C. J.J.S.

Calculated by: J.J.S., J. L. S.

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1									3.5 H	(3.9) S	4.0 H	(4.3) FH	A	4.1	4.5	4.3	4.6							
2									4.1	4.1	(4.2) A	4.4	4.3	(4.2) H	4.1	4.0	4.1							
3									3.8 F	3.7 F	4.0	4.1	4.2	3.9 H	4.2	(3.8)	C							
4									4.1	3.6	4.0	4.1	4.1	4.3	A	4.1	A							
5									4.0 H	A	3.8 F	4.2	4.2	4.0	4.2	C	4.4 H							
6									4.1	4.2 H	4.0 F	A	(4.2) A	(4.3) A	C	A	A							
7									C	A	4.2	4.2	4.2	4.2	A	4.1	3.9							
8									3.8 H	3.9	A	3.9	A	4.0	4.2	4.1	3.7							
9									A	A	4.1	4.2 F	C	4.2	4.4	4.1	S							
10									3.9 HF	3.7	3.9	4.2	4.2	4.2	4.1	4.5	4.3							
11									A	(3.8) S	4.2	4.1	4.1 H	4.4	4.4	4.0	3.9							
12									4.1 H	4.3	4.4 H	A	4.2	4.4	4.0	C	(3.5) S							
13									3.8	A	4.2	4.2 F	4.3	4.3	4.4	4.5	A							
14									4.2 H	4.2 H	4.2 H	4.1	4.3	4.5	4.4	4.4	3.7	3.6						
15									A	A	A	A	A	4.2	A	A	(3.8) AS	3.8						
16									A	A	A	(4.4) A	4.2	4.2	4.2	4.2	3.8							
17									3.9 H	4.2	4.0	4.2	4.2	A	A	(3.9) A	4.4							
18									3.7 H	(4.3) A	4.2	4.1	4.5	4.5	4.6	4.0	4.1	(4.1) FS						
19									4.0	4.1 H	4.3 H	4.4	4.5	4.5	(4.4) A	A	(4.1) S	3.6						
20									3.7	4.4 H	4.5	4.4	4.4	4.3	(3.9) A	3.9	3.9	4.2						
21									A	4.2 H	4.3	A	A	4.4	(4.4) A	4.2	4.4	3.9						
22									3.7 H	A	A	4.4	4.5	4.2 H	4.2	4.2	4.4	4.1						
23									3.8	4.3 H	4.4	4.4	4.5	A	4.2	4.2	4.3							
24									3.7	C	C	C	C	4.2	4.2	4.4	4.1							
25									4.1 HK	4.1 FK	4.2 K	4.1 K	4.1 K	4.4 K	4.2 K	4.1 K	B K							
26									4.0	4.3	4.1	(4.1) S	4.4	4.4	4.2	4.0	S							
27									4.2	4.1	4.1	A	4.3	B	(4.1) B	4.2	4.2							
28									3.7 H	(4.3) A	4.1	4.4	4.3	C	C	4.3	A							
29									A H	4.1	A	A	(4.3) A	4.5	4.6	4.2	(4.4) A	4.6						
30									(3.6) H	A	4.2	4.4	4.2	4.3	4.6	4.4	4.1							
31									3.8 H	4.1 H	4.2	4.4	4.5	4.3	4.4	B	3.6							
Median									3.9	4.1	4.2	4.2	4.3	4.3	4.2	4.2	4.1	4.0						
Count									24	22	25	24	26	27	25	25	23	8						

Sweep 1.0 Mc to 25.0 Mc in 0.25 min

Manual ☐ Automatic ☒

Table 61

Ionospheric Storminess at Washington, D. C.

January 1949

Day	Ionospheric character* 00-12 GCT	Ionospheric character* 12-24 GCT	Principal storms Beginning GCT	Principal storms End GCT	Geomagnetic character** 00-12 GCT	Geomagnetic character** 12-24 GCT
1	1	2			3	2
2	3	2			5	3
3	1	3			1	1
4	1	3			0	1
5	2	3			1	1
6	2	1			2	1
7	2	1			3	2
8	2	1			2	3
9	2	2			3	3
10	2	1			2	2
11	3	2			3	3
12	3	2			2	3
13	2	2			3	2
14	2	2			2	1
15	2	2			1	2
16	2	1			2	2
17	0	2			2	2
18	1	1			3	3
19	0	1			3	2
20	1	1			2	2
21	2	1			3	2
22	1	1			3	1
23	1	1			1	2
24	1	1			2	4
25	4	4	0000	----	6	7
26	4	1	----	1200	7	3
27	4	1	0500	1200	4	2
28	2	2			2	2
29	1	1			2	2
30	1	1			1	1
31	1	2			1	2

*Ionosphere character figure (I-figure) for ionospheric storminess at Washington, D. C., during 12-hour period, on an arbitrary scale of 0 to 9, 9 representing the greatest disturbance.

**Average for 12 hours of Cheltenham, Maryland, geomagnetic K-figures on an arbitrary scale of 0 to 9, 9 representing the greatest disturbance.

----Dashes indicate continuing storm.

Table 62

Sudden Ionosphere Disturbances Observed at Washington, D. C.

January 1949

1949 Day	GCT Beginning	GCT End	Location of transmitters	Relative intensity at minimum*	Other phenomena
January 15	1945	2025	Ohio, D.C.	0.05	
15	2154	2215	Ohio, D.C.	0.3	Terr.mag.pulse** 2149-2155
16	1658	1715	Ohio, D.C., England	0.1	
19	2025	2100	Ohio, D.C.	0.2	Terr.mag.pulse** 2023-2040 Solar flare*** 2030
20	1730	1755	Ohio, D.C., England	0.1	Terr.mag.pulse** 1727-1750
20	1902	1940	Ohio, D.C., England	0.1	
24	1545	1600	Ohio, D.C., England	0.3	
25	2043	2100	Ohio, D.C.	0.1	
31	1946	2020	Ohio, D.C.	0.05	

*Ratio of received field intensity during SID to average field intensity before and after, for station W8XAL, 6080 kilocycles, 600 kilometers distant.

**As observed on Cheltenham magnetogram of the United States Coast and Geodetic Survey.

***Time of observation at McMath-Hulbert Observatory, Michigan.

Table 63

Sudden Ionosphere Disturbances Reported by Engineer-in-Chief, Cable and Wireless, Ltd., as Observed in England

1948 Day	GCT Beginning	GCT End	Receiving station	Location of transmitters
December 23	1215	1300	Brentwood	Austria, Bahrein I., Belgian Congo, Bulgaria, Canary Is., Chile, Greece, India, Iran, Kenya, Madagascar, Malta, Palestine, Portugal, Southern Rhodesia, Spain, Switzerland, Syria, Trans-Jordan, Turkey, U.S.S.R., Yugoslavia, Zanzibar
23	1215	1240	Somerton	Aden, Argentina, Ascension I., Australia, Barbados, Brazil, Canada, Ceylon, China, Egypt, Gold Coast, India, Malay States, New York, Union of S. Africa
30	1600	1620	Somerton	Argentina, Barbados, Brazil, Canada, New York

Table 64

Sudden Ionosphere Disturbances Reported by RCA Communications, Inc., as Observed at Point Reyes, California

1949 Day	GCT Beginning	GCT End	Location of transmitters
January			
14	0430	0830	China, Chosen, Japan, Philippine Is.
15	2153	2230	Australia, Hawaii, Japan, Philippine Is.
23	0120	0230	Australia, Hawaii, Japan, Philippine Is.

Table 65

Sudden Ionosphere Disturbances Reported by International Telephone and Telegraph Corporation, as Observed at Platanos, Argentina

1948 Day	GCT Beginning	GCT End	Location of transmitters
December			
3	1345	1420	Bolivia, Brazil, Chile, Colombia, Denmark, England, Germany, New York, Peru, Switzerland, Venezuela
7	1355	1410	Bolivia, Brazil, Chile, Denmark, England, New York, Switzerland, Venezuela
9	1154	1225	Brazil, Chile, Denmark, Germany, Netherlands, New York, Spain, Venezuela
20	1728	1755	Bolivia, Brazil, Chile, Denmark, England, France, New York, Spain, Venezuela
23	1215	1330	Bolivia, Brazil, Chile, Denmark, England, Germany, Italy, Netherlands, New York, Peru, Switzerland, Venezuela
24	1643	1710	Brazil, Chile, Denmark, Germany, Netherlands, New York, Peru, Spain
27	1430	1445	Bolivia, Brazil, Chile, Denmark, England, Germany, New York, Peru, Switzerland, Venezuela
27	1713	1725	Bolivia, Brazil, Chile, Germany, Netherlands, New York, Peru, Spain, Venezuela

Note: Observers are invited to send to the CRPL information on times of beginning and end of sudden ionosphere disturbances for publication as above. Address letters to the Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D. C.

Table 66

Provisional Radio Propagation Quality Figures
(Including Comparisons with CRPL Warnings and CRPL Probable Disturbed Period Forecasts)
December 1948

Day	North Atlantic							North Pacific						
	Quality figure		CRPL* Warning		CRPL** Forecast of probable disturbed periods	Geo-mag-netic K_{Ch}		Quality figure		CRPL* Warning		CRPL** Forecast of probable disturbed periods	Geo-mag-netic K_{Ch}	
	01-12 GCT	13-24 GCT	01-12 GCT	13-24 GCT		01-12 GCT	13-24 GCT	01-12 GCT	13-24 GCT	01-12 GCT	13-24 GCT		01-12 GCT	13-24 GCT
1	7	7				1	1	6	5				1	1
2	6	7				2	1	7	5				2	1
3	6	6				3	0	6	6				3	0
4	6	6				1	1	6	5				1	1
5	7	7				2	1	6	6				2	1
6	8	7				3	4	6	5				3	4
7	6	6	X	X		4	3	5	(4)	X	X		4	3
8	7	6	X			2	2	5	5	X			2	2
9	6	7				2	1	5	5				2	1
10	7	6				1	2	5	6				1	2
11	7	6				3	2	5	6				3	2
12	6	7				1	0	6	5				1	0
13	6	6				1	3	6	5				1	3
14	5	6	X		X	4	3	5	6	X		X	4	3
15	5	6			X	2	2	6	5			X	2	2
16	6	6			X	2	3	6	5			X	2	3
17	6	7	X		X	2	1	6	5	X		X	2	1
18	6	6				2	1	5	6				2	1
19	6	6				2	1	7	5				2	1
20	6	6				1	2	5	6				1	2
21	6	6				3	3	6	5				3	3
22	6	6	X		X	3	1	5	(3)	X		X	3	1
23	6	6			X	1	2	6	6			X	1	2
24	6	7				3	2	6	7				3	2
25	6	6			X	3	4	6	5			X	3	4
26	6	6	X		X	2	1	6	5	X		X	2	1
27	6	5				2	2	6	5				2	2
28	6	7				0	1	6	6				0	1
29	6	6				2	2	5	6				2	2
30	5	6				2	4	5	5				2	4
31	5	5	X			4	3	5	6	X			4	3
Score:														
H			0		0					1		1		
M			0		0					1		1		
G			24		23					24		22		
(S)			2		2					3		6		
S			5		6					2		1		

*Broadcast on WWV, Washington, D.C. Times of warnings recorded to nearest half day as broadcast.

**In addition to dates marked X, the following was designated as a probable disturbed day on forecasts more than eight days in advance of said date: December 18.

Quality Figure Scale:
- 1 - Useless
- 2 - Very poor
- 3 - Poor
- 4 - Poor to fair
- 5 - Fair
- 6 - Fair to good
- 7 - Good
- 8 - Very good
- 9 - Excellent

Symbols:
- X Warning given or probable disturbed date
- H Quality 4 or worse on day or half day of warning
- M Quality 4 or worse on day or half day of no warning
- G Quality 5 or better on day of no warning
- (S) Quality 5 on day of warning
- S Quality 6 or better on day of warning
- ( ) Quality 4 or worse (disturbed)

Geomagnetic K_{Ch} on the standard scale of 0 to 9, 9 representing the greatest disturbance

Table 67

American and Zürich Provisional Relative Sunspot Numbers

January 1949

Date	R_A*	R_Z**	Date	R_A*	R_Z**
1	128	108	17	212	143
2	144	95	18	217	161
3	112	82	19	221	177
4	111	88	20	221	169
5	103	70	21	187	167
6	105	87	22	182	153
7	124	91	23	179	158
8	135	94	24	182	152
9	145	106	25	169	152
10	155	118	26	139	139
11	147	109	27	117	90
12	130	114	28	109	86
13	166	122	29	95	80
14	165	125	30	127	90
15	158	118	31	185	119
16	183	138	Mean:	153.3	119.4

*Combination of reports from 46 observers; see page 8.

**Dependent on observations at Zürich Observatory and its stations at Locarno and Arosa.

Table 68a

Coronal observations at Climax, Colorado (5303A), east limb

Date GCT	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5	0°	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	
	Degrees north of the solar equator																			Degrees south of the solar equator																		
1949																																						
Jan. 6.8	X	X	X	X	X	X	X	2	2	5	15	18	17	18	20	25	28	18	19	19	18	18	18	16	10	8	6	2	2	-	-	-	-	-	-	-	-	0
7.8	-	-	-	-	-	2	2	3	5	6	15	24	23	22	33	35	30	25	22	22	21	22	27	16	12	10	6	4	3	3	2	-	-	-	-	-	-	0
11.9	X	-	-	-	-	-	-	3	5	7	7	10	20	28	25	17	15	13	11	9	12	15	29	20	13	8	8	8	4	3	3	2	-	-	-	-	-	*
12.8	3	-	-	-	-	-	2	4	6	6	12	14	31	25	24	26	22	22	20	27	28	30	40	23	20	15	12	13	10	5	3	2	-	-	-	-	-	*
13.8	-	-	-	-	-	-	-	3	4	7	9	10	12	13	15	14	14	13	12	16	15	15	14	12	11	5	7	9	3	2	2	2	2	-	-	-	-	*
17.8	-	-	-	-	-	-	-	-	-	3	3	4	8	8	13	13	14	9	10	15	16	14	12	12	9	8	3	7	6	4	3	-	-	-	-	-	-	*
19.7	-	-	-	-	-	-	-	-	-	-	-	1	2	3	3	2	3	4	7	10	13	9	17	13	9	8	4	-	-	-	-	-	-	-	-	-	-	*
21.7	-	-	1	1	2	3	4	6	8	5	9	9	10	13	18	24	27	30	23	29	25	21	15	15	11	9	3	4	4	5	5	4	3	3	2	2	2	*
25.8	-	-	-	-	-	-	-	-	-	-	-	-	2	8	10	14	13	12	19	23	20	13	22	13	13	11	9	8	6	5	5	4	2	-	-	-	-	*
29.8	-	-	2	2	3	4	5	4	3	3	8	11	12	12	12	13	11	12	14	16	25	28	14	14	13	3	2	-	-	-	-	-	-	-	-	-	-	*

*Beginning January 11, measurements are made directly on solar rotation coordinates.

Table 69a

Coronal observations at Climax, Colorado (6374A), east limb

ate GCT	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5	0°	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	P
	Degrees north of the solar equator																			Degrees south of the solar equator																		
1949																																						
an. 6.8	X	X	X	X	X	X	X	-	-	-	-	10	2	1	2	13	10	8	10	2	2	5	14	12	3	1	1	1	1	1	1	1	-	-	-	-	-	0
7.8	4	6	5	1	1	-	-	-	-	-	-	-	2	1	1	16	8	13	11	9	7	11	14	3	2	1	1	1	1	1	1	1	1	1	1	1	1	0
11.9	X	-	2	5	3	3	2	1	1	-	1	2	1	12	4	4	4	4	3	1	1	5	8	2	1	-	-	-	-	-	-	1	2	1	1	1	1	*
12.8	2	3	4	4	3	2	1	1	1	1	1	1	2	2	2	8	12	1	1	1	12	12	10	7	2	1	1	-	-	-	-	1	1	1	-	1	2	*
13.8	2	2	2	3	3	2	1	1	1	1	1	1	1	1	1	11	2	2	2	3	5	4	3	3	-	-	-	-	-	1	1	1	1	1	1	1	1	*
17.8	2	2	2	2	-	-	-	-	-	-	1	1	2	8	12	10	2	1	3	13	12	2	1	1	1	1	-	1	1	1	-	-	-	-	-	-	-	*
19.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	3	4	1	3	9	1	-	-	-	-	-	-	-	-	-	-	-	1	*
21.7	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	10	1	-	-	1	7	1	3	4	-	-	-	-	-	-	-	-	-	-	-	1	*
25.8	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	8	10	9	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	*
29.8	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	1	1	10	11	8	2	1	-	-	-	-	-	-	-	-	-	-	-	-	*

*Beginning January 11, measurements are made directly on solar rotation coordinates.

Table 70a

Coronal observations at Climax, Colorado (6704A), east limb

ate GCT	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5	0°	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	P
	Degrees north of the solar equator																			Degrees south of the solar equator																		
949																																						
an. 6.8	X	X	X	X	X	X	X	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	0
7.8	-	-	-	-	-	-	-	-	-	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	0
11.9	X	-	-	-	-	-	-	-	-	-	-	1	2	3	3	2	1	1	1	1	1	1	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	*
12.8	-	-	-	-	-	-	-	-	-	-	1	2	2	2	2	2	2	1	1	2	2	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	*
13.8	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	-	-	-	-	-	-	-	-	-	-	-	*
17.8	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	*
19.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	*
21.7	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	2	2	2	2	2	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	*
25.8	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*
29.8	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	*

*Beginning January 11, measurements are made directly on solar rotation coordinates.

Table 68b

Coronal observations at Climax, Colorado (5303A), west limb

Date	Degrees south of the solar equator																	0°	Degrees north of the solar equator																	P
GCT	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5		5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	
1949																																						
Jan. 6.8	-	-	-	-	-	2	2	2	3	4	5	8	8	11	25	20	22	23	23	18	19	19	19	20	19	15	10	5	4	4	3	X	X	X	X	X	X	0
7.8	-	-	-	2	2	3	3	4	5	5	6	8	10	12	20	25	30	32	22	23	24	24	22	16	14	12	11	8	7	5	5	4	4	-	-	-	-	0
11.9	-	-	-	-	-	-	2	3	3	3	3	4	7	10	14	23	15	13	12	10	12	15	17	14	13	8	7	6	5	3	2	2	X	X	X	X	X	*
12.8	-	-	-	-	-	3	6	10	9	9	10	12	12	18	27	31	15	9	8	9	20	23	23	22	21	17	10	6	6	8	8	8	8	9	5	4	3	*
13.8	-	-	-	-	-	4	6	6	7	8	10	11	15	19	23	22	19	10	-	10	14	14	14	10	12	13	10	3	6	5	3	3	-	-	-	-	-	*
17.8	-	-	-	-	2	3	3	4	5	5	3	9	10	12	15	22	24	24	14	4	4	6	8	9	10	8	5	4	3	2	2	2	2	2	-	-	-	*
19.7	-	-	-	-	-	-	-	-	-	-	-	5	6	10	14	26	26	15	12	11	14	15	15	15	14	13	13	9	3	3	-	-	-	-	-	-	-	*
21.7	2	-	-	-	-	-	-	-	2	2	5	10	20	20	24	28	23	20	20	26	25	34	25	25	25	19	14	9	5	-	-	-	-	-	-	-	-	*
25.8	-	-	-	-	-	-	-	-	-	-	4	7	14	16	27	20	20	17	15	14	16	17	16	17	18	11	9	5	4	3	2	-	-	-	-	-	-	*
29.8	-	-	-	-	-	-	4	6	9	10	11	12	13	13	16	14	13	13	14	15	18	12	12	17	13	12	10	8	5	-	-	-	-	-	-	-	-	*

*Beginning January 11, measurements are made directly on solar rotation coordinates.

Table 69b

Coronal observations at Climax, Colorado (6374A), west limb

Date	Degrees south of the solar equator																	0°	Degrees north of the solar equator																	P
GCT	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5		5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	
1949																																						
Jan. 6.8	-	-	-	-	-	-	-	-	-	-	-	-	1	2	4	3	1	1	3	-	2	3	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	0
7.8	1	-	-	-	-	-	-	-	1	1	1	1	1	2	2	2	1	7	10	6	7	8	8	3	1	-	-	-	-	-	-	1	1	2	2	2	4	0
11.9	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	1	2	3	3	3	1	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	*
12.8	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	2	-	1	1	1	1	1	-	-	-	-	-	-	-	-	-	1	1	2	*
13.8	1	1	1	1	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	2	2	2	1	-	-	-	-	-	-	-	-	1	1	1	2	3	2	*
17.8	-	-	-	-	-	-	1	1	1	2	2	2	1	1	3	4	4	4	-	-	1	1	1	1	-	-	-	-	-	-	-	-	1	1	1	1	2	*
19.7	-	-	-	-	-	-	-	3	2	2	3	2	1	3	4	12	14	1	2	2	2	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	*
21.7	1	1	1	1	-	-	1	3	4	4	3	2	6	4	5	13	10	12	11	9	10	12	5	1	-	1	5	2	2	3	2	2	2	2	2	2	2	*
25.8	1	1	1	1	1	1	1	1	-	-	1	1	1	1	10	3	4	2	-	2	4	5	3	3	1	1	1	1	2	2	2	2	2	2	2	2	1	*
29.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	11	10	9	9	8	10	8	7	7	1	-	-	-	-	-	1	1	2	2	2	*

*Beginning January 11, measurements are made directly on solar rotation coordinates.

Table 70b

Coronal observations at Climax, Colorado (6704A), west limb

Date	Degrees south of the solar equator																	0°	Degrees north of the solar equator																	P
GCT	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5		5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	
1949																																						
Jan. 6.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	2	1	1	1	1	1	1	-	-	-	-	-	-	-	X	X	X	X	X	X	0
7.8	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	2	2	2	2	2	2	2	2	1	1	-	-	-	-	-	-	-	-	-	-	0
11.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	*
12.8	-	-	-	-	-	-	-	-	-	-	-	1	1	2	2	2	1	1	-	-	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	*
13.8	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	2	1	1	-	-	-	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	*
17.8	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*
19.7	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	2	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*
21.7	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	2	1	1	1	2	2	2	2	2	2	1	-	-	-	-	-	-	-	-	-	-	-	*
25.8	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	2	2	1	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	*
29.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	*

*Beginning January 11, measurements are made directly on solar rotation coordinates.

GRAPHS OF IONOSPHERIC DATA

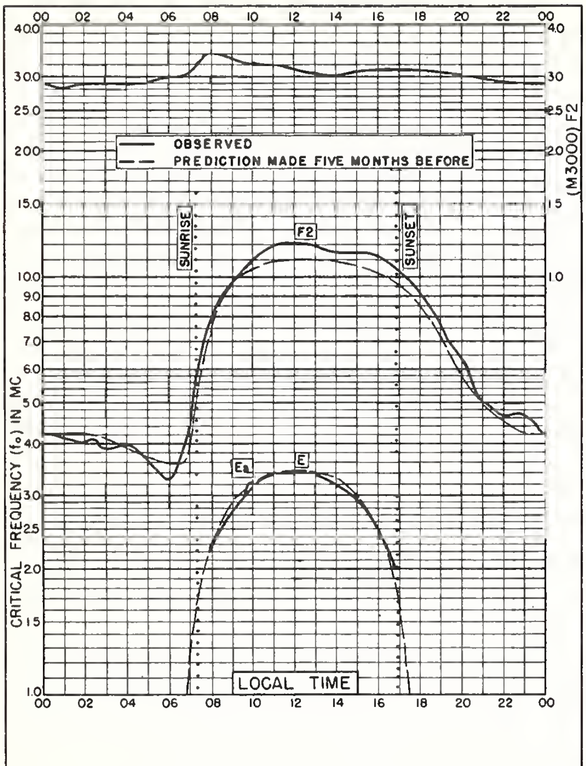


Fig. 1. WASHINGTON, D. C.
39. 0°N, 77. 5°W JANUARY 1949

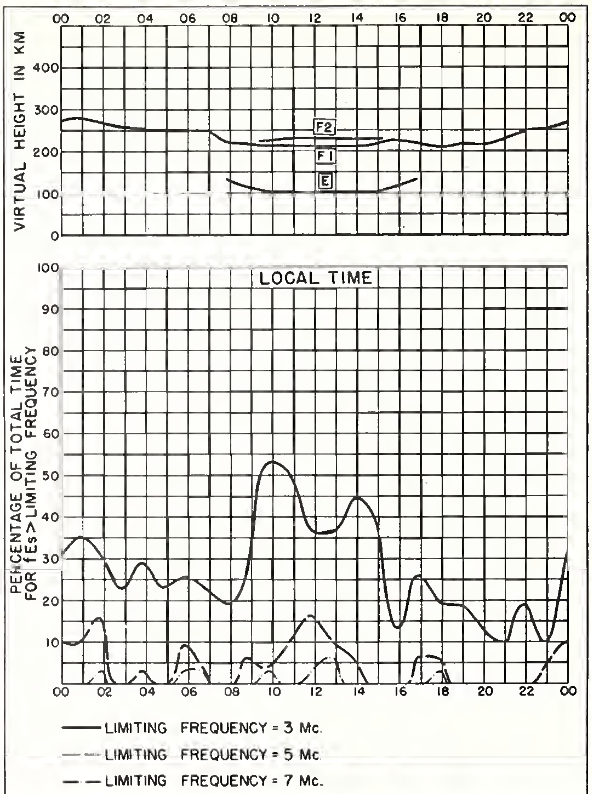


Fig. 2. WASHINGTON, D. C. JANUARY 1949

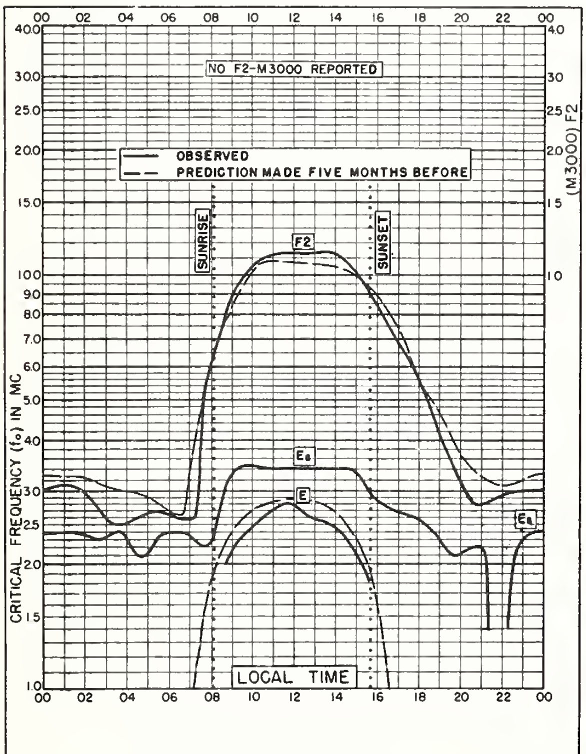


Fig. 3. LINDAU/HARZ, GERMANY
51. 6°N, 10. 1°E DECEMBER 1948

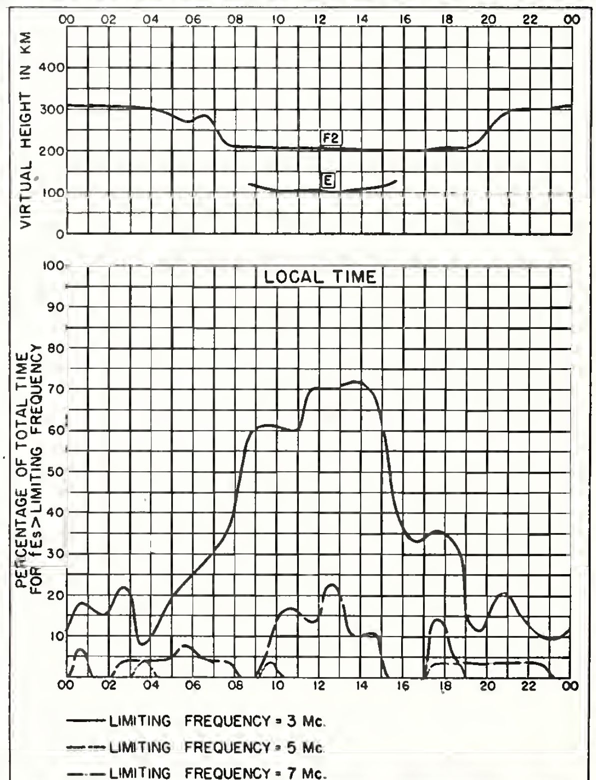


Fig. 4. LINDAU/HARZ, GERMANY DECEMBER 1948

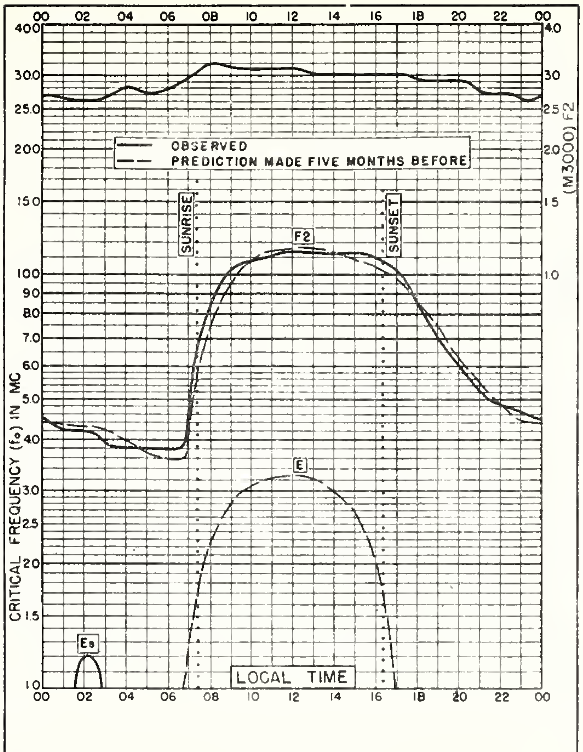


Fig. 5. BOSTON, MASSACHUSETTS
42. 4°N, 71. 2°W DECEMBER 1948

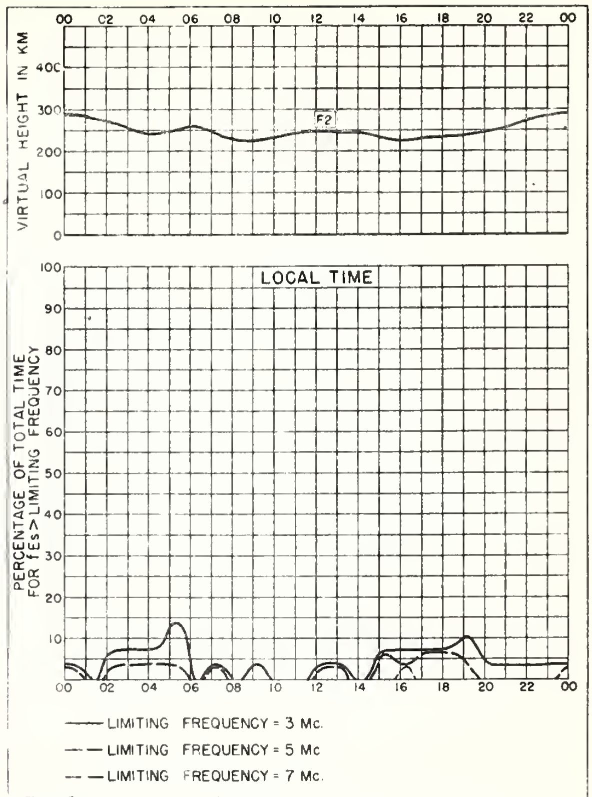


Fig 6 BOSTON, MASSACHUSETTS DECEMBER 1948

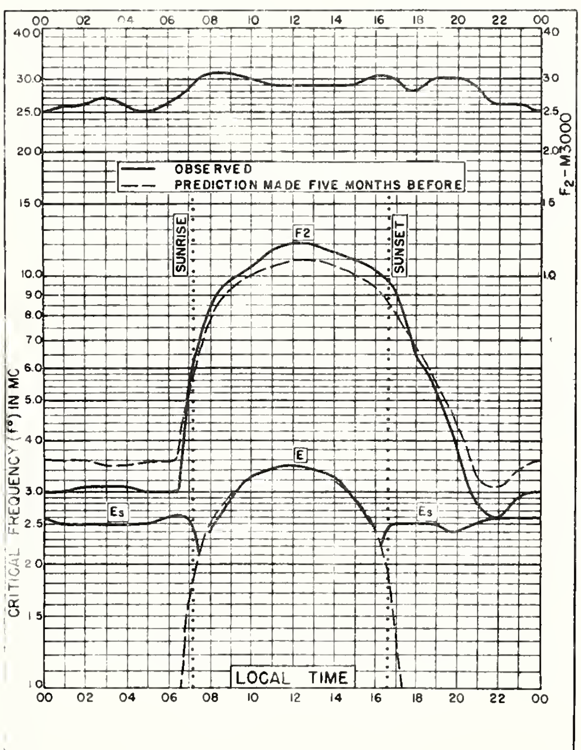


Fig. 7 SAN FRANCISCO, CALIFORNIA
37. 4°N, 122. 2°W DECEMBER 1948

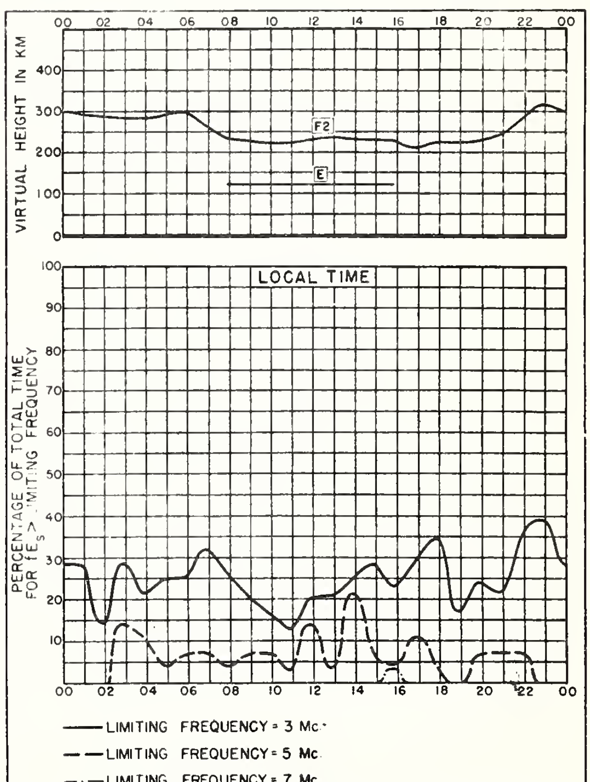


Fig. 8. SAN FRANCISCO, CALIFORNIA DECEMBER 1948

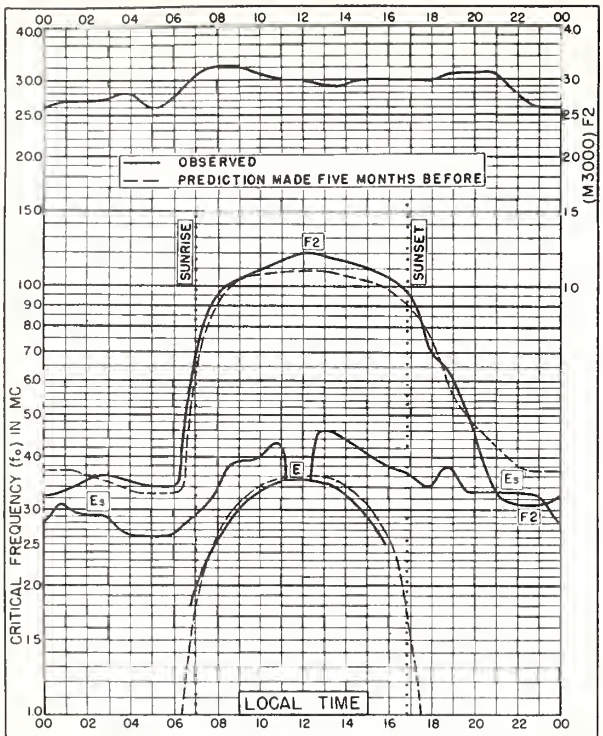


Fig. 9. WHITE SANDS, NEW MEXICO
32.3°N, 106.5°W DECEMBER 1948

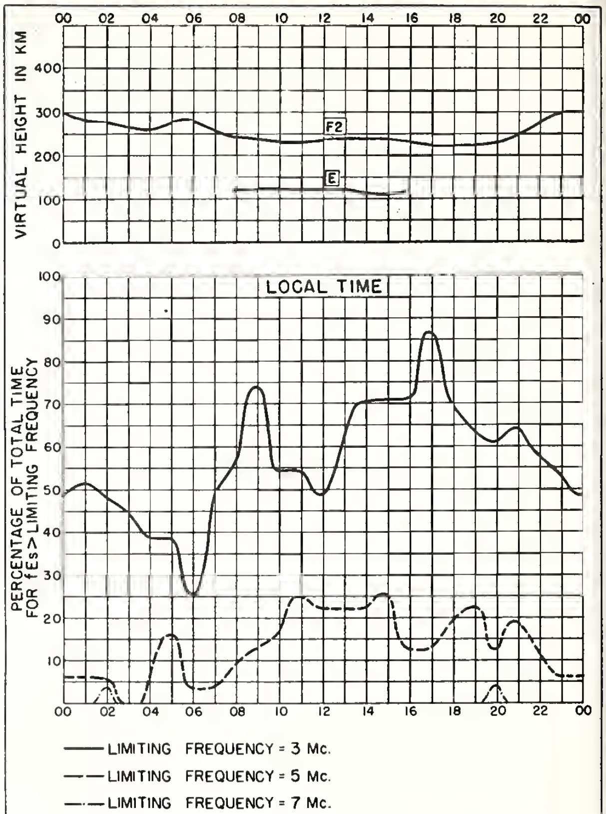


Fig. 10. WHITE SANDS, NEW MEXICO DECEMBER 1948

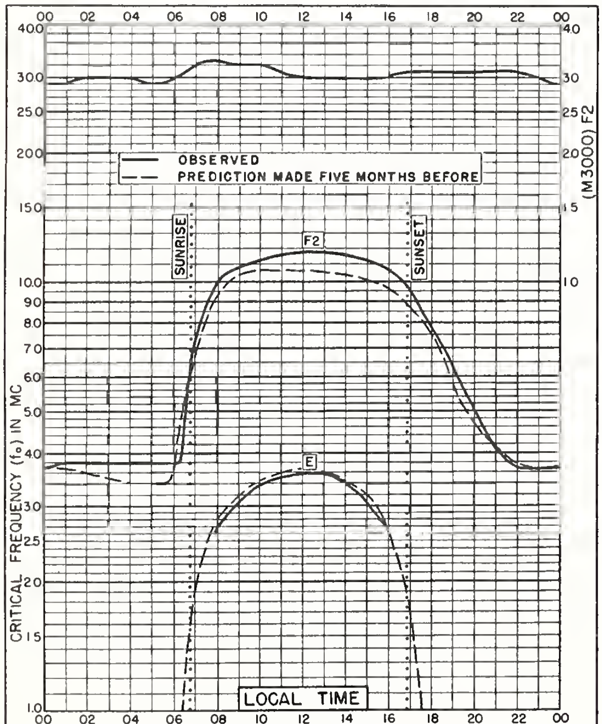


Fig. 11. BATON ROUGE, LOUISIANA
30.5°N, 91.2°W DECEMBER 1948

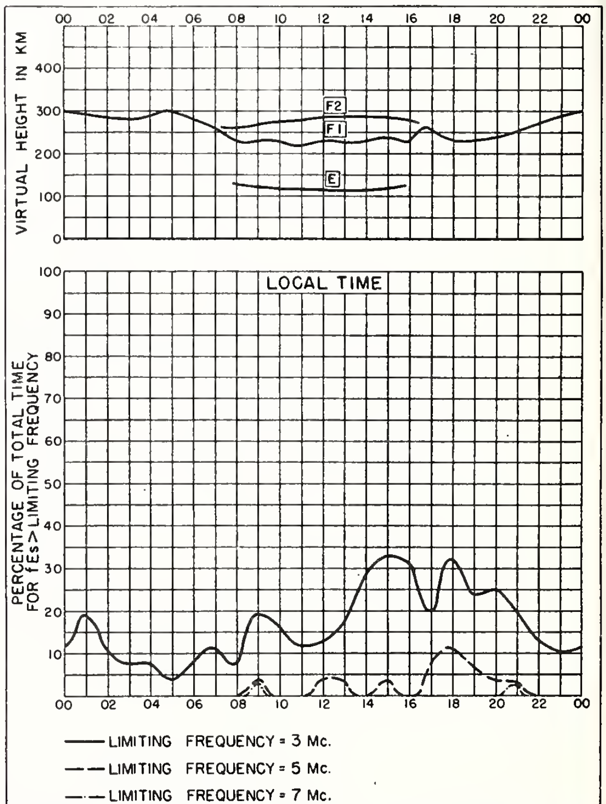


Fig. 12. BATON ROUGE, LOUISIANA DECEMBER 1948

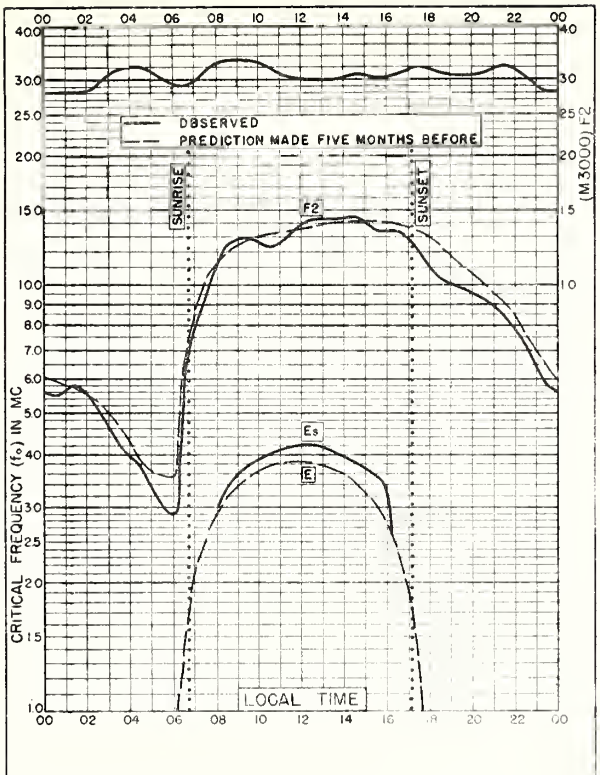


Fig. 13. OKINAWA I.
26.3°N, 127.7°E DECEMBER 1948

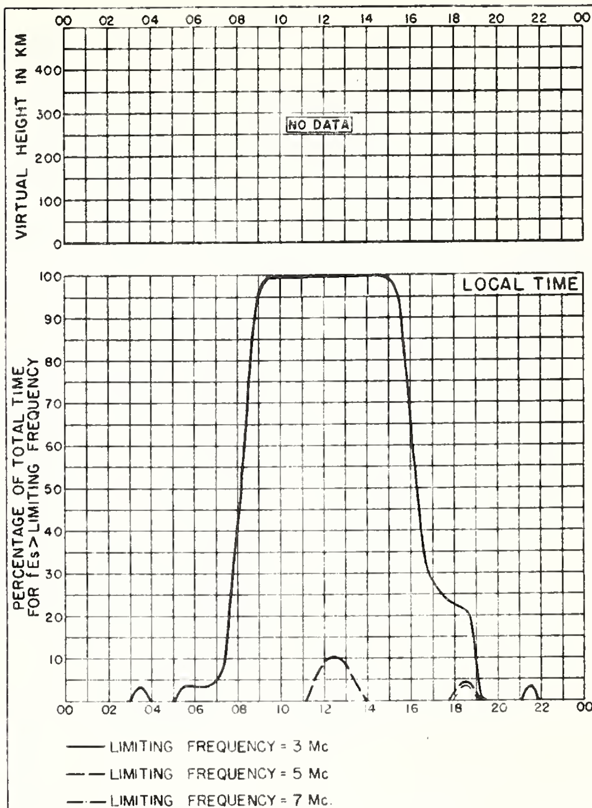


Fig 14 OKINAWA I. DECEMBER 1948

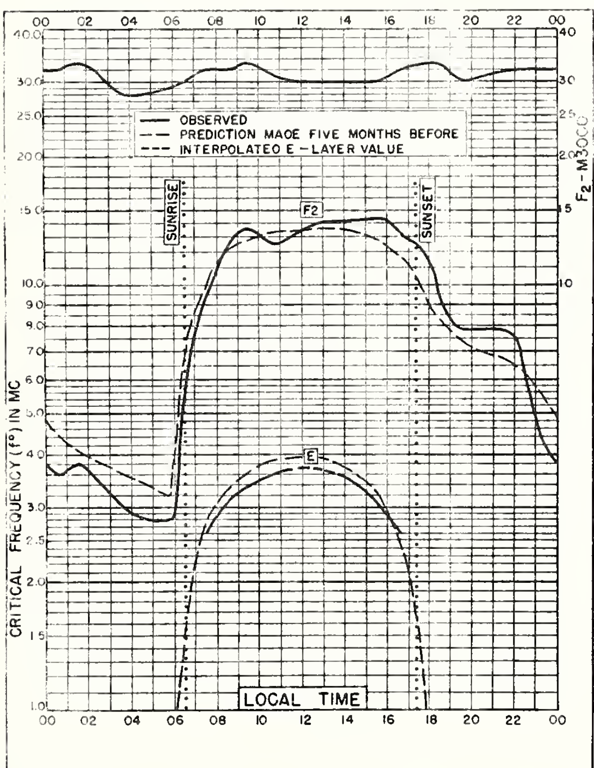


Fig. 15. MAUI, HAWAII
20.8°N, 156.5°W DECEMBER 1948

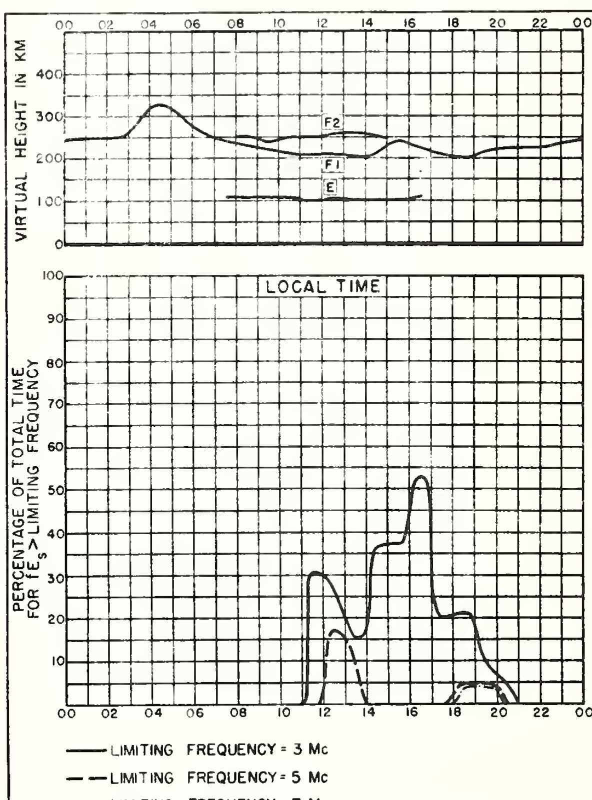


Fig. 16. MAUI, HAWAII DECEMBER 1948

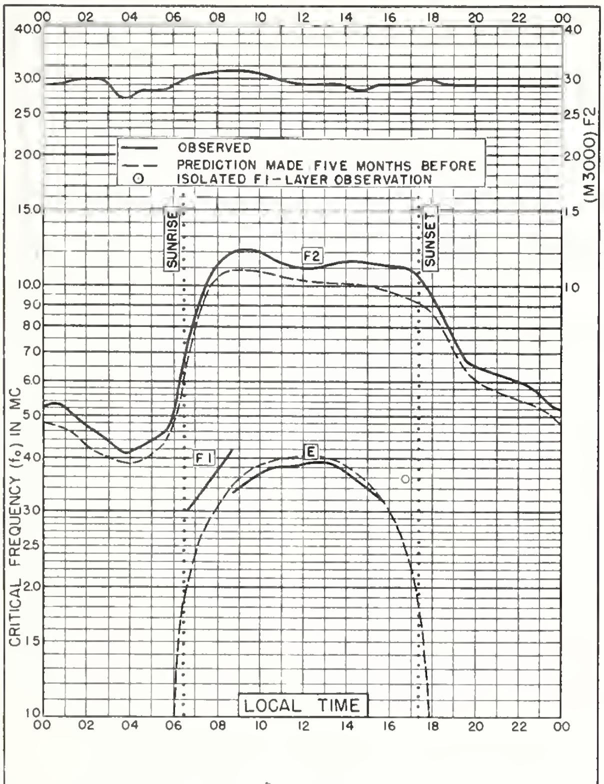


Fig. 17. SAN JUAN, PUERTO RICO
18.4°N, 66.1°W DECEMBER 1948

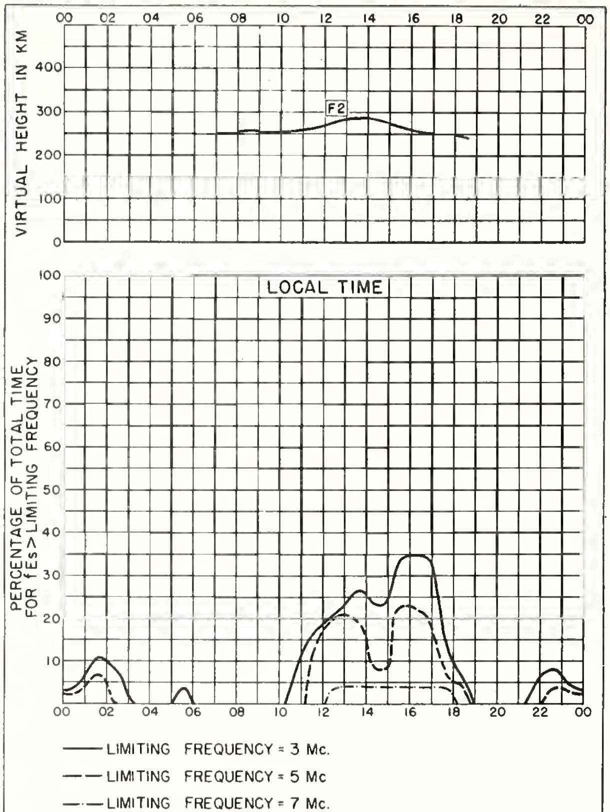


Fig. 18. SAN JUAN, PUERTO RICO DECEMBER 1948

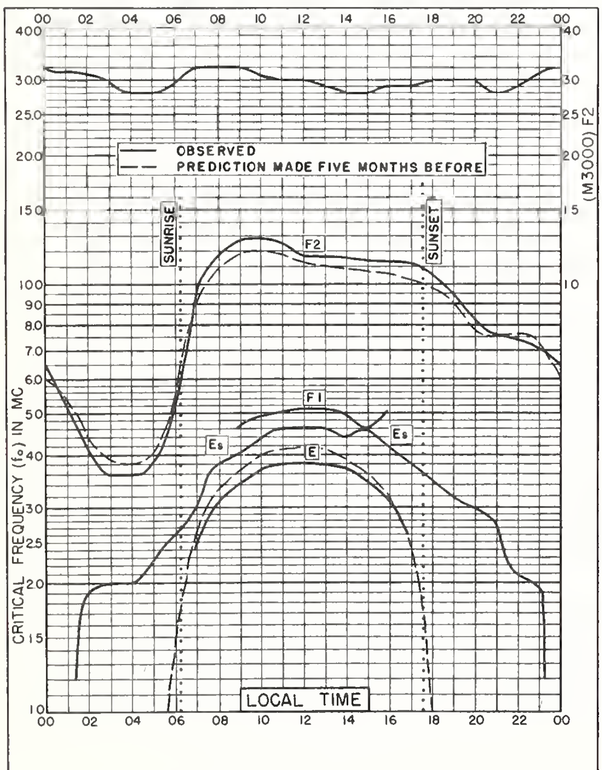


Fig. 19. TRINIDAD, BRIT. WEST INDIES
10.6°N, 61.2°W DECEMBER 1948

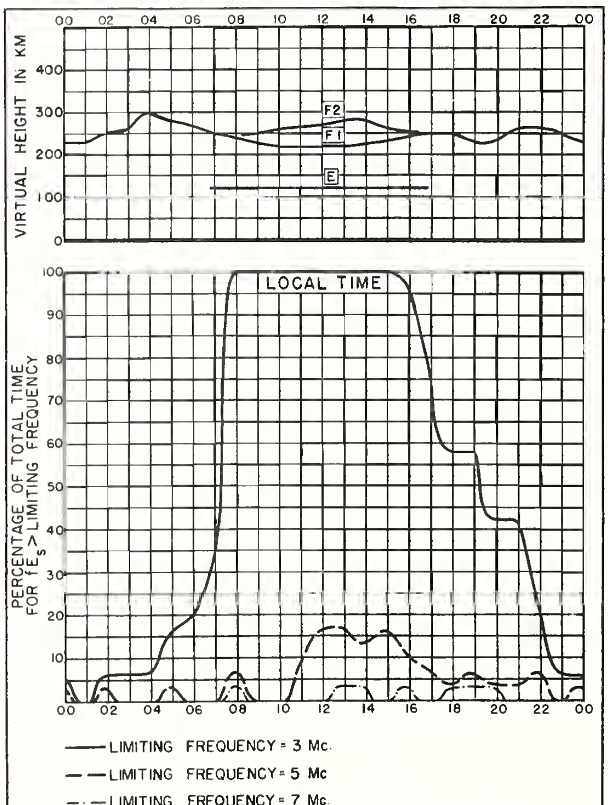


Fig. 20. TRINIDAD, BRIT. WEST INDIES DECEMBER 1948

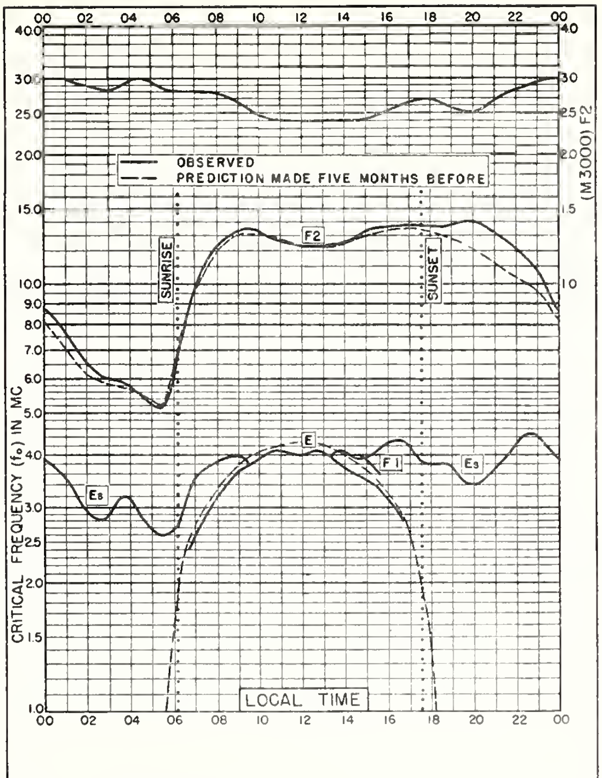


Fig. 21. PALMYRA I.
5. 9°N, 162.1°W DECEMBER 1948

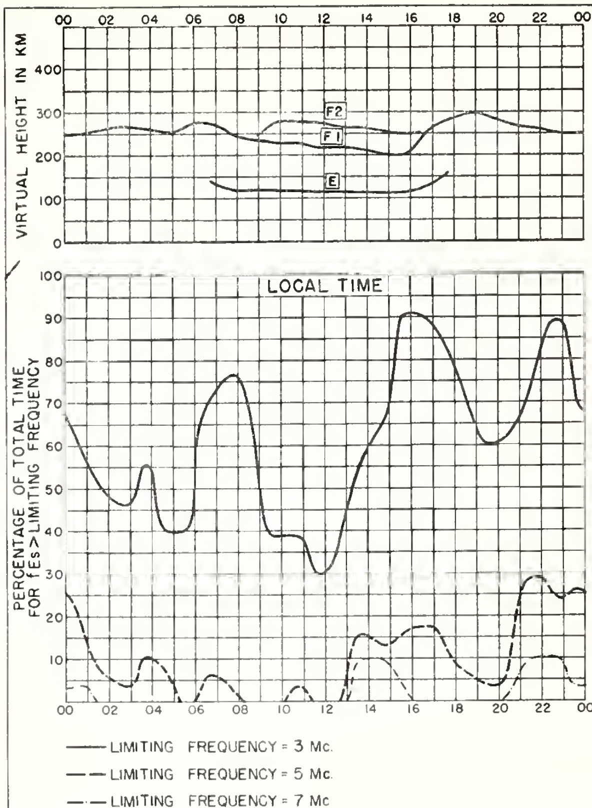


Fig. 22. PALMYRA I. DECEMBER 1948

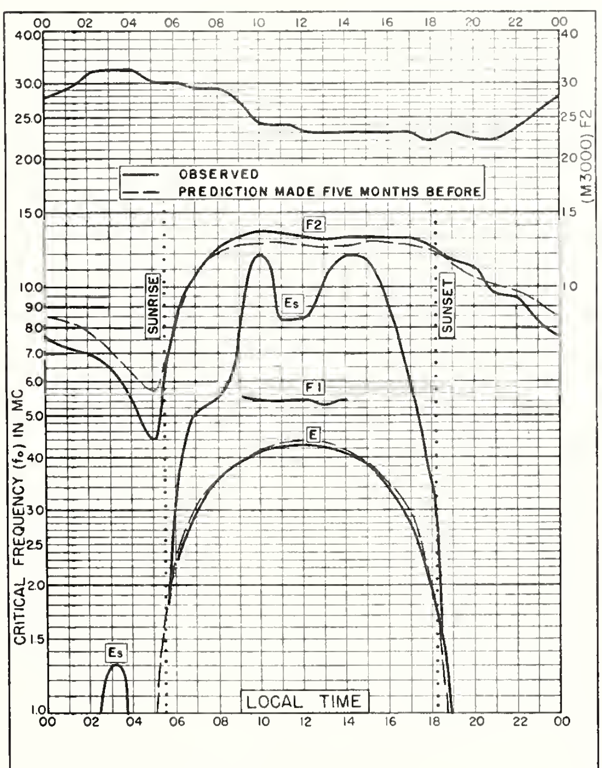


Fig. 23. HUANCAYO, PERU
12. 0°S, 75. 3°W DECEMBER 1948

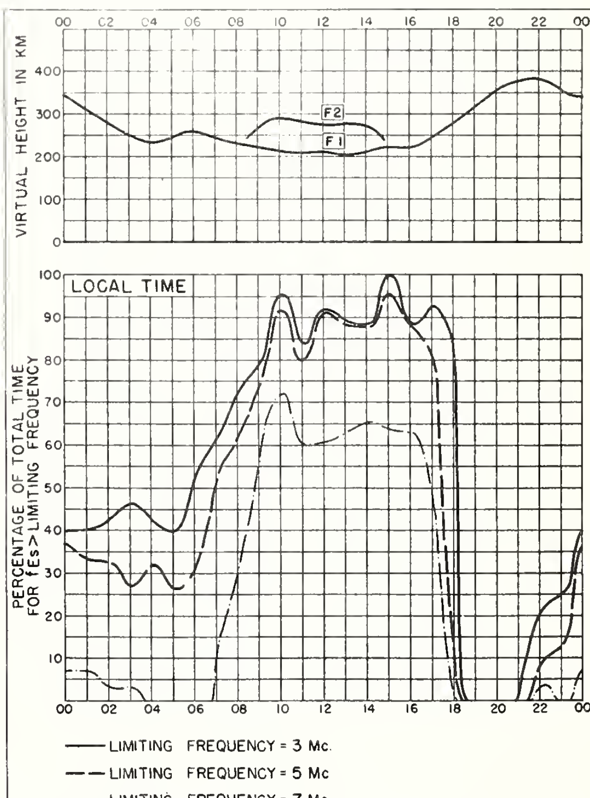


Fig. 24 HUANCAYO, PERU DECEMBER 1948

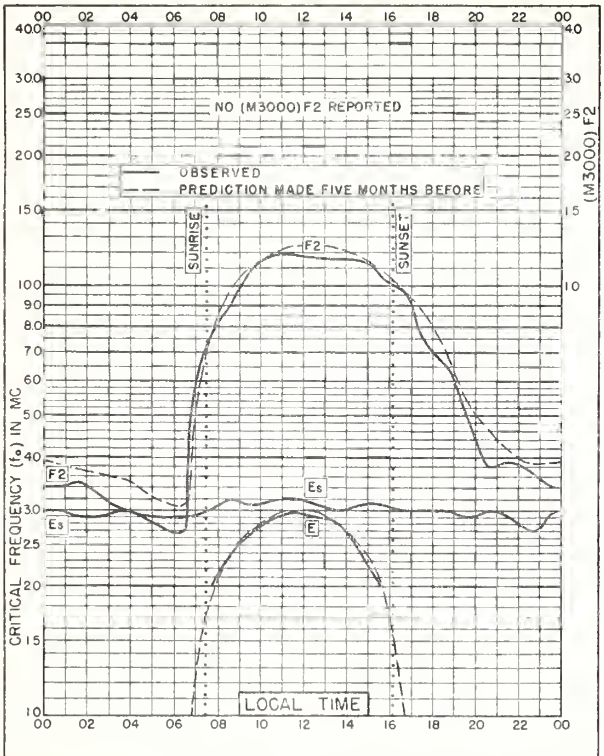


Fig. 25. LINDAU/HARZ, GERMANY
51.6°N, 10.1°E NOVEMBER 1948

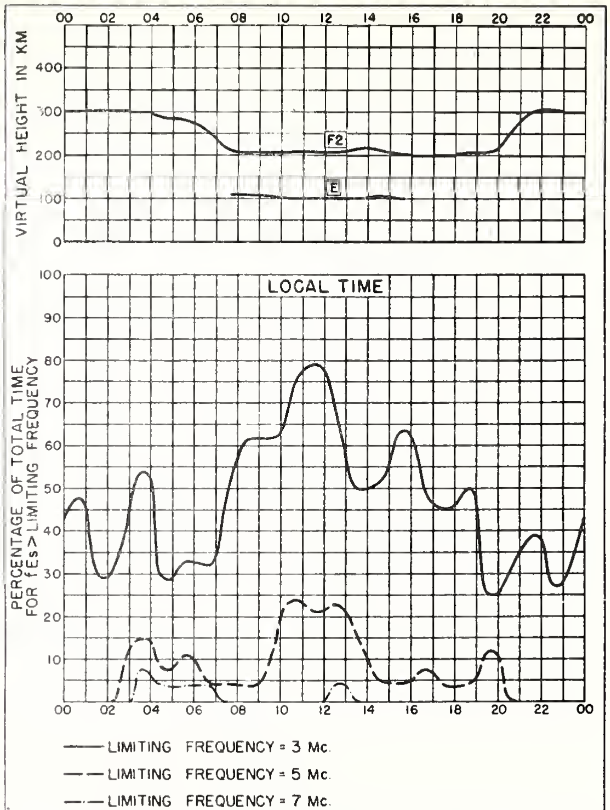


Fig. 26. LINDAU/HARZ, GERMANY NOVEMBER 1948

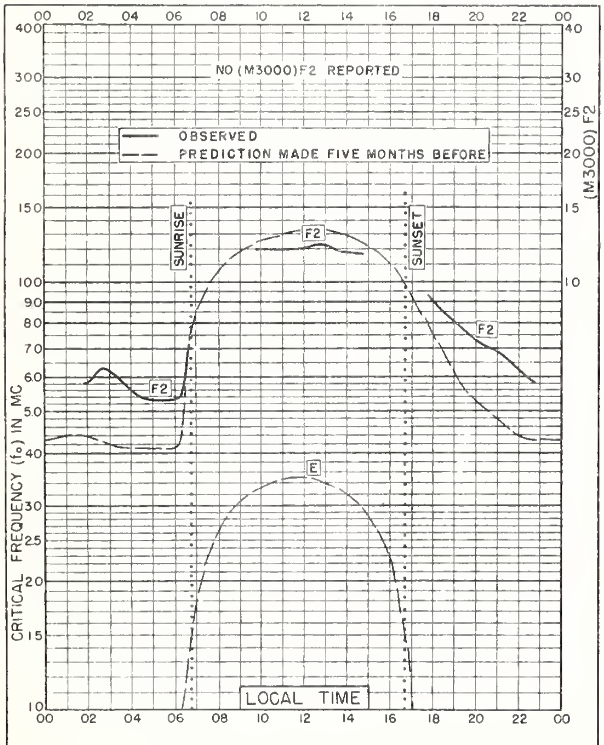


Fig. 27. PEIPING, CHINA
39.9°N, 116.4°E NOVEMBER 1948

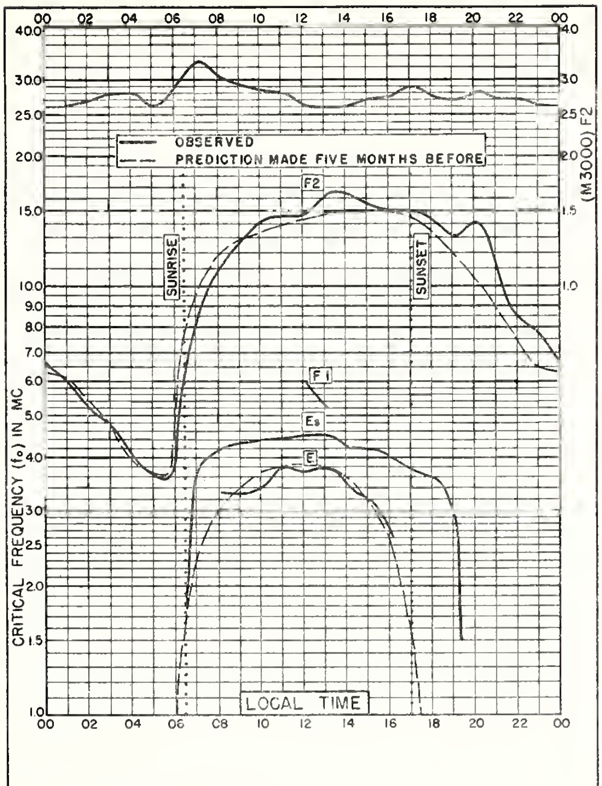


Fig. 28. CHUNGKING, CHINA
29.4°N, 106.8°E NOVEMBER 1948

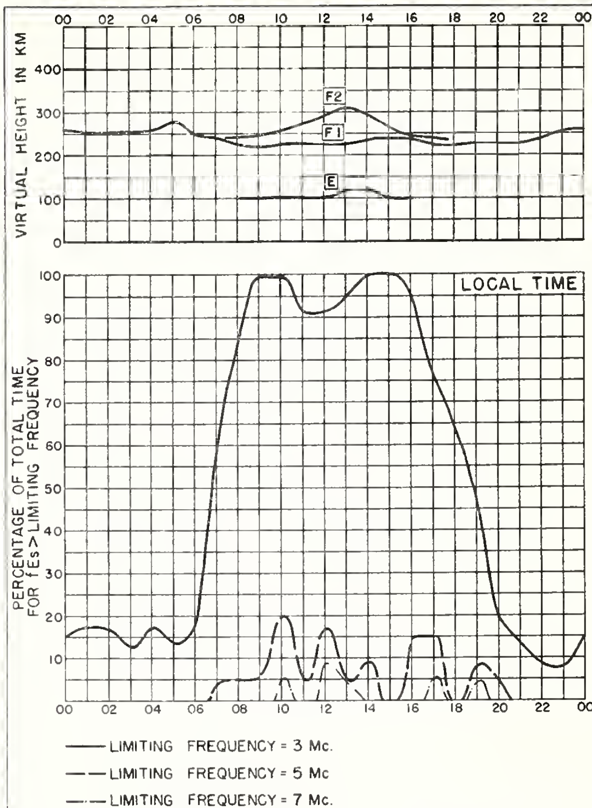


Fig. 29. CHUNGKING, CHINA NOVEMBER 1948

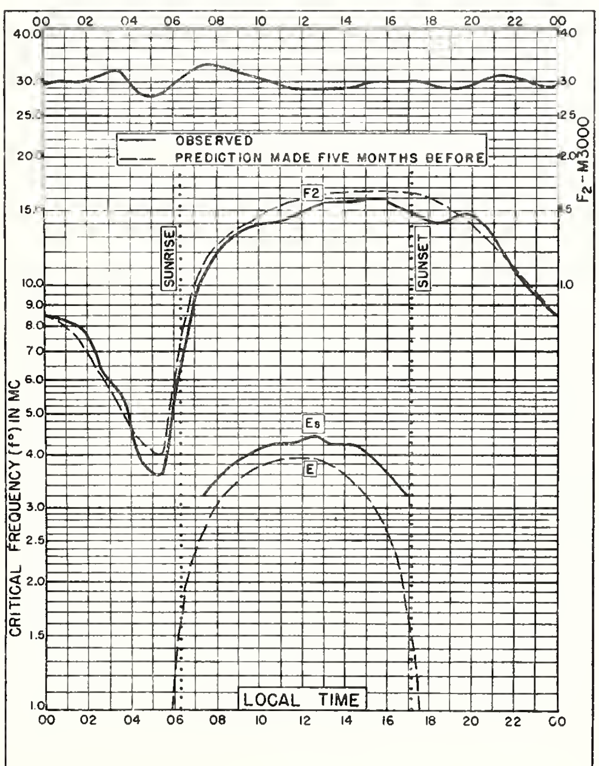


Fig. 30. OKINAWA I.
26.3°N, 127.7°E NOVEMBER 1948

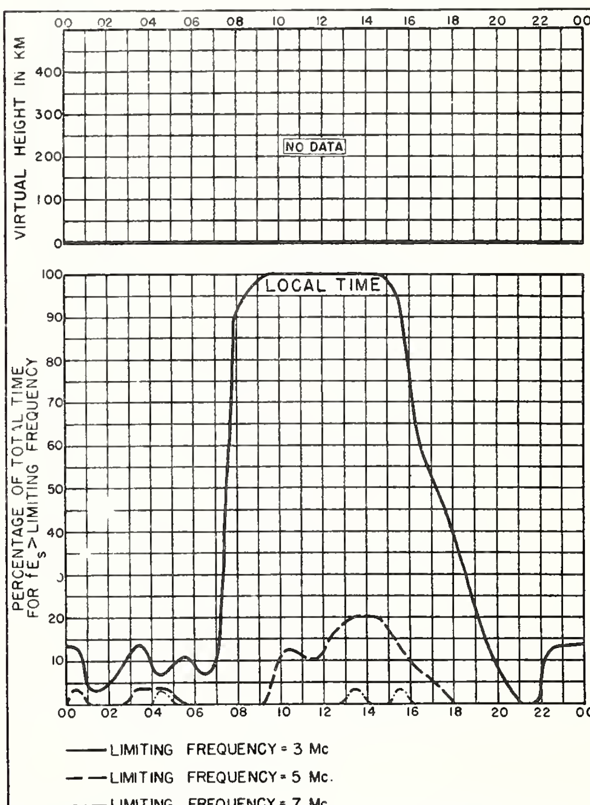


Fig. 31. OKINAWA I. NOVEMBER 1948

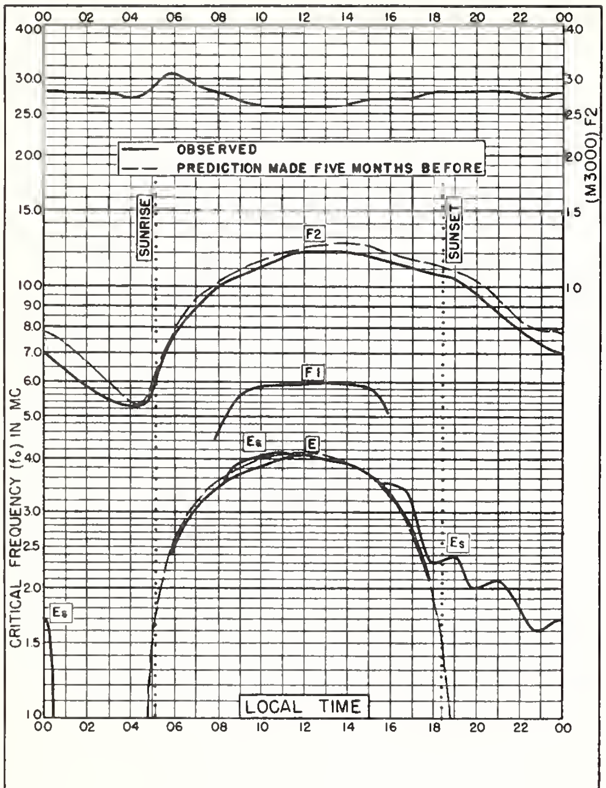


Fig 32. JOHANNESBURG, U. OF S. AFRICA
26.2°S, 28.0°E NOVEMBER 1948

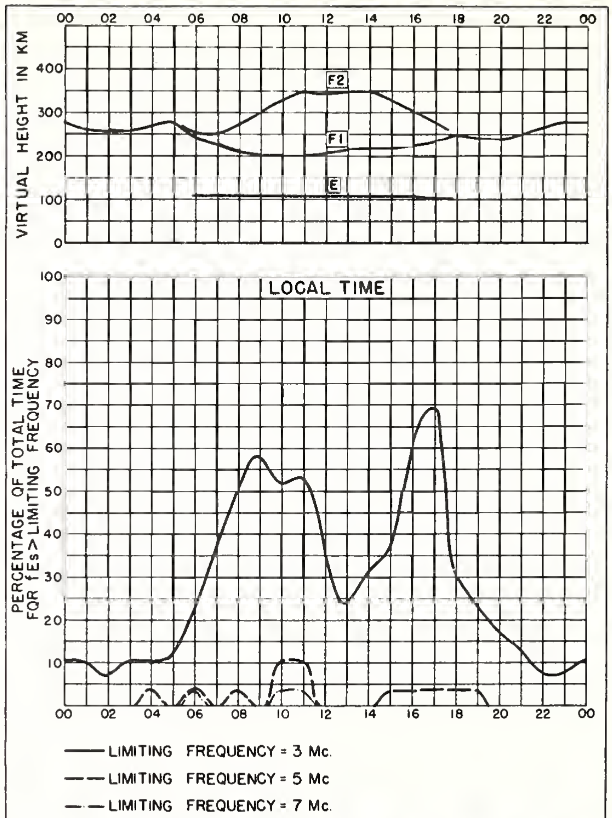


Fig. 33. JOHANNESBURG U. OF S. AFRICA NOVEMBER 1948

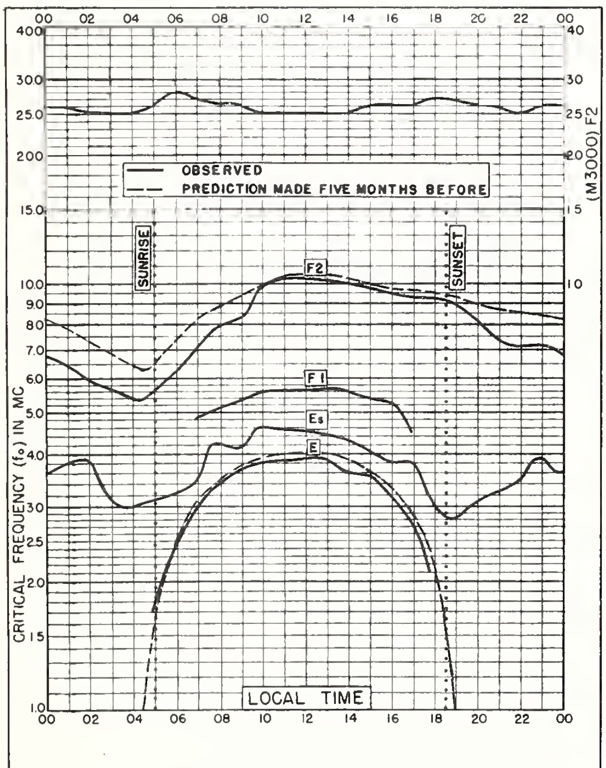


Fig. 34. WATHEROO, W. AUSTRALIA
30.3°S, 115.9°E NOVEMBER 1948

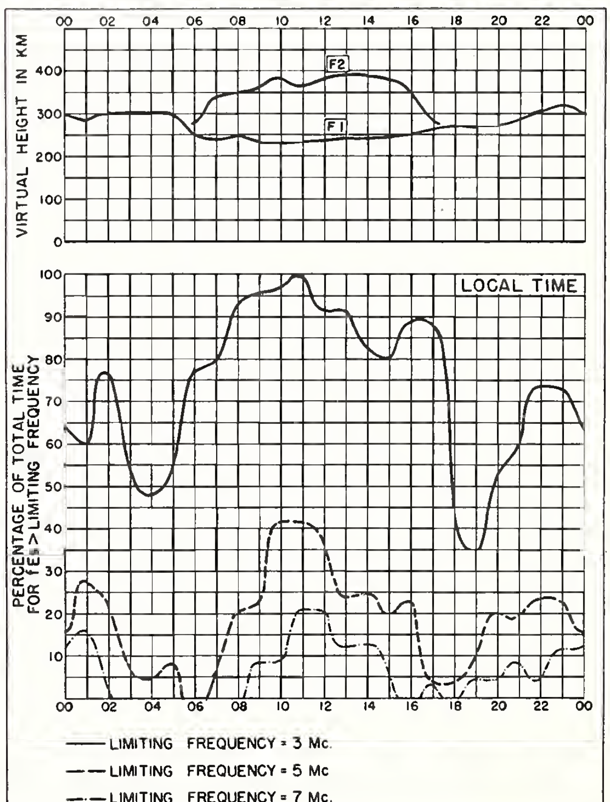


Fig. 35. WATHEROO, W. AUSTRALIA NOVEMBER 1948

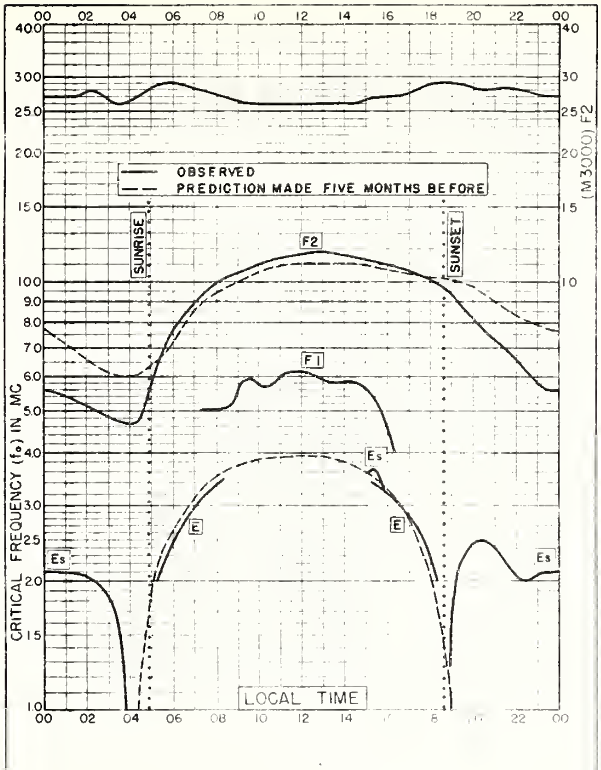


Fig. 36 CAPETOWN, U. OF S. AFRICA
34.2°S, 18.3°E NOVEMBER 1948

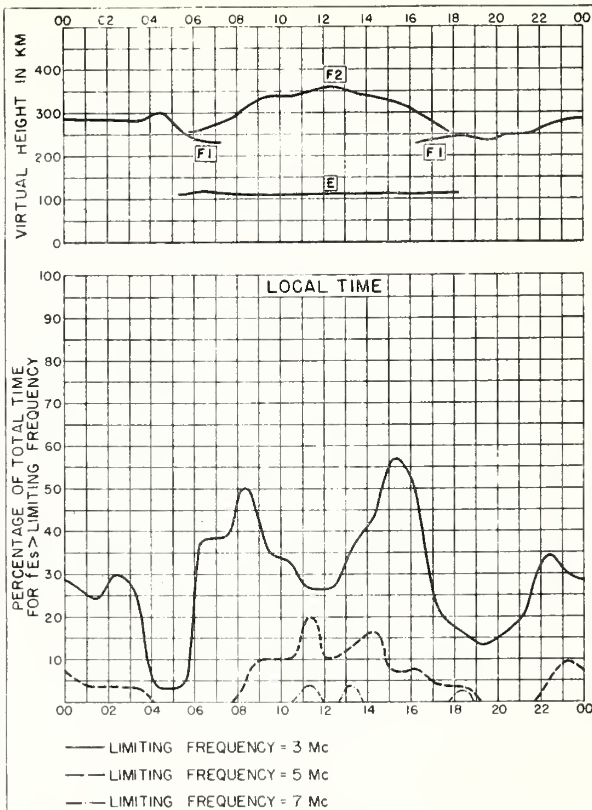


Fig. 37 CAPETOWN, U. OF S. AFRICA NOVEMBER 1948

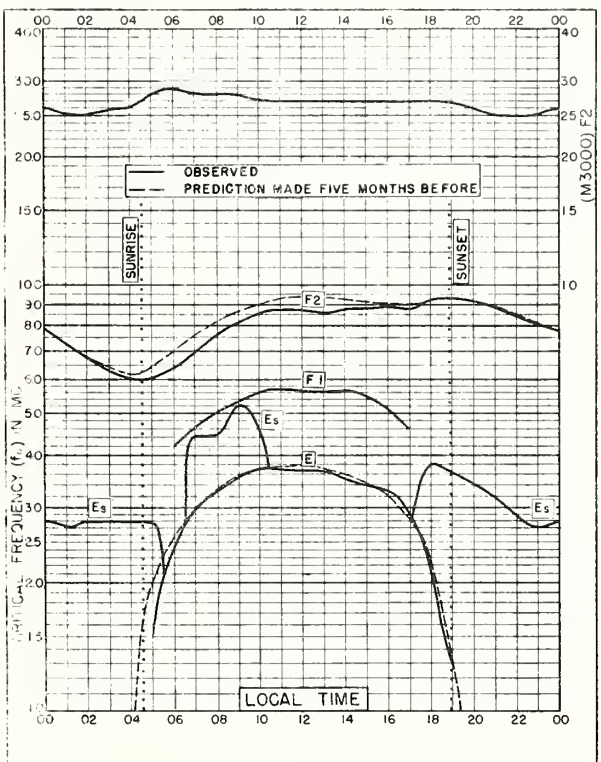


Fig. 38. CHRISTCHURCH, N. Z.
43.5°S, 172.7°E NOVEMBER 1948

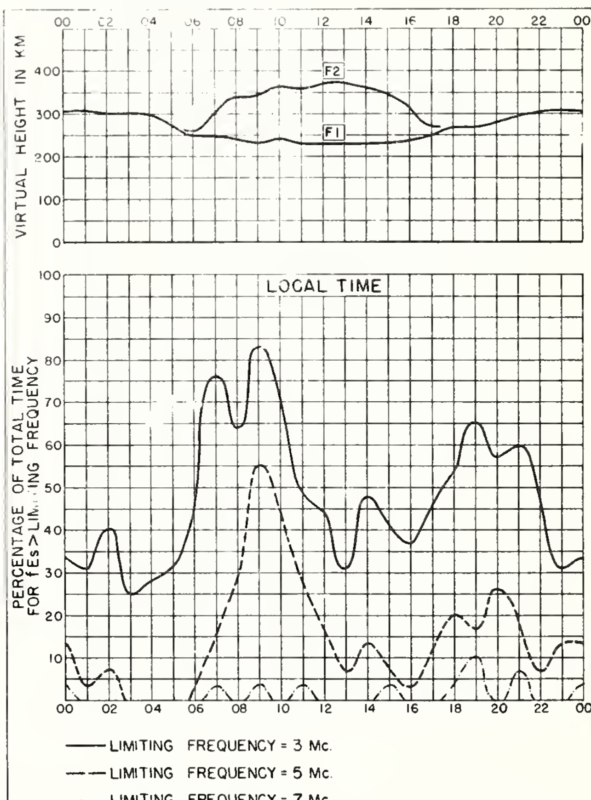


Fig. 39. CHRISTCHURCH, N. Z. NOVEMBER 1948

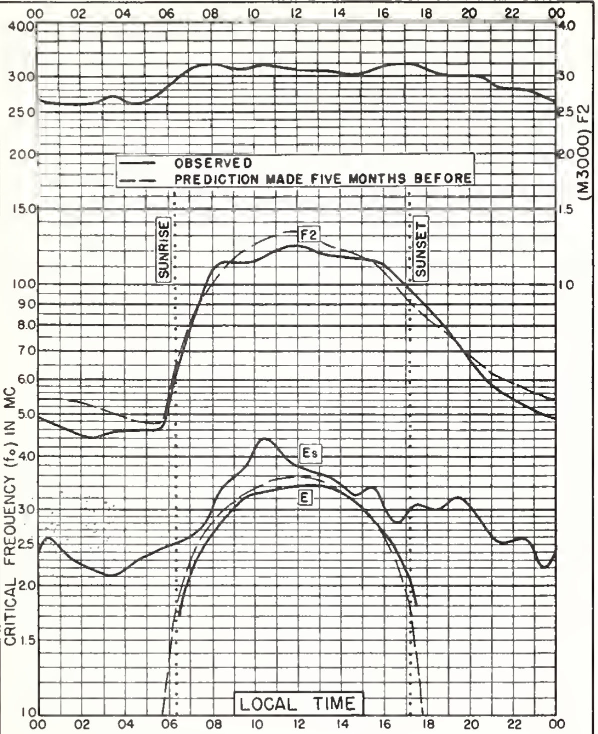


Fig. 40. WAKKANAI, JAPAN
45.4°N, 141.7°E OCTOBER 1948

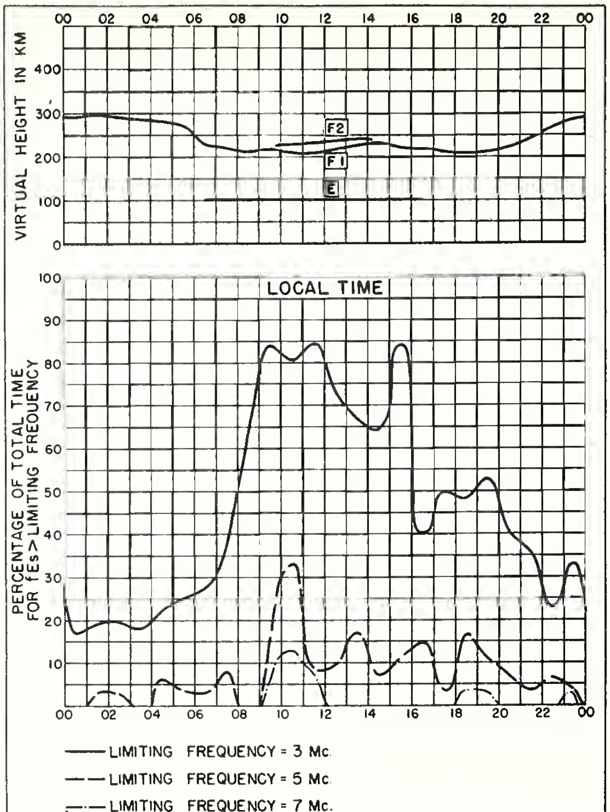


Fig. 41. WAKKANAI, JAPAN OCTOBER 1948

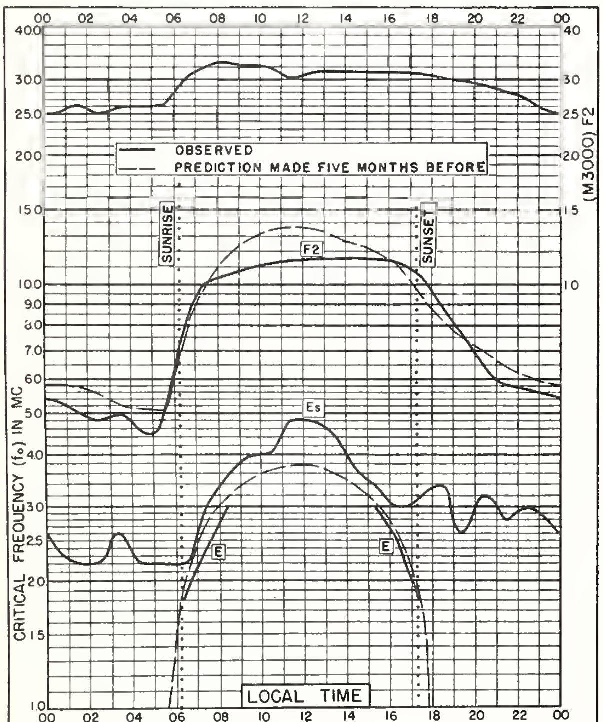


Fig. 42. FUKAURA, JAPAN
40.6°N, 139.9°E OCTOBER 1948

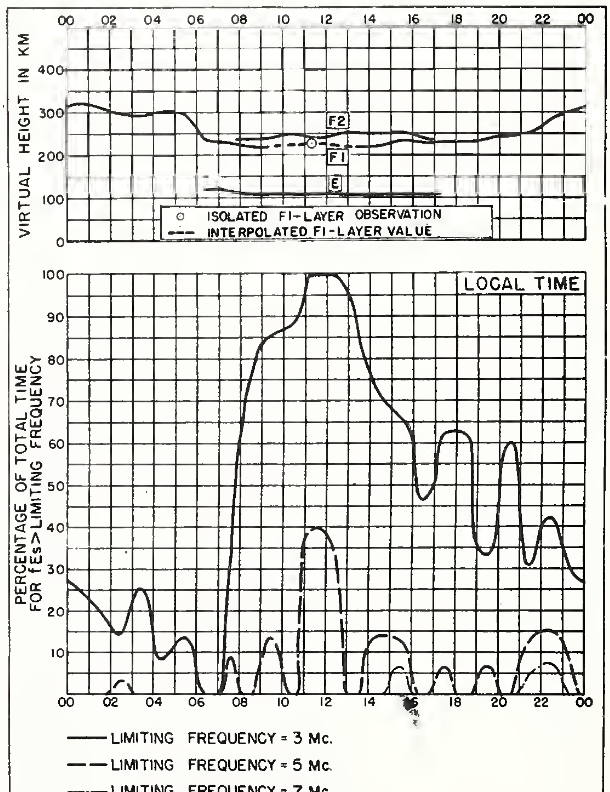


Fig. 43. FUKAURA, JAPAN OCTOBER 1948

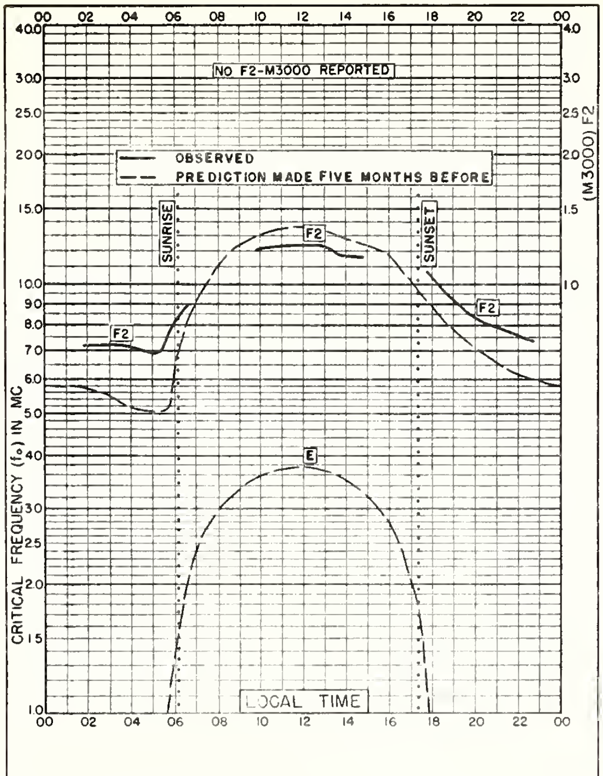


Fig. 44 PEIPING, CHINA
39.9°N, 116.4°E OCTOBER 1948

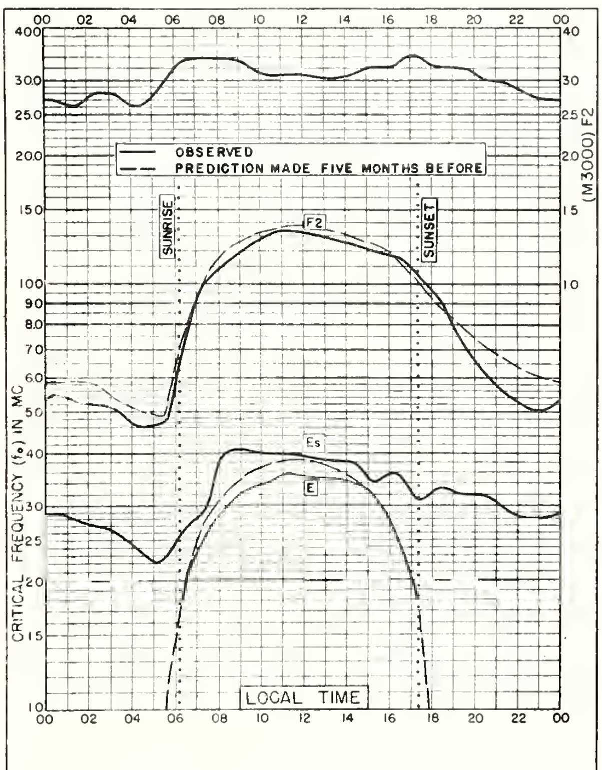


Fig. 45 SHIBATA, JAPAN
37.9°N, 139.3°E OCTOBER 1948

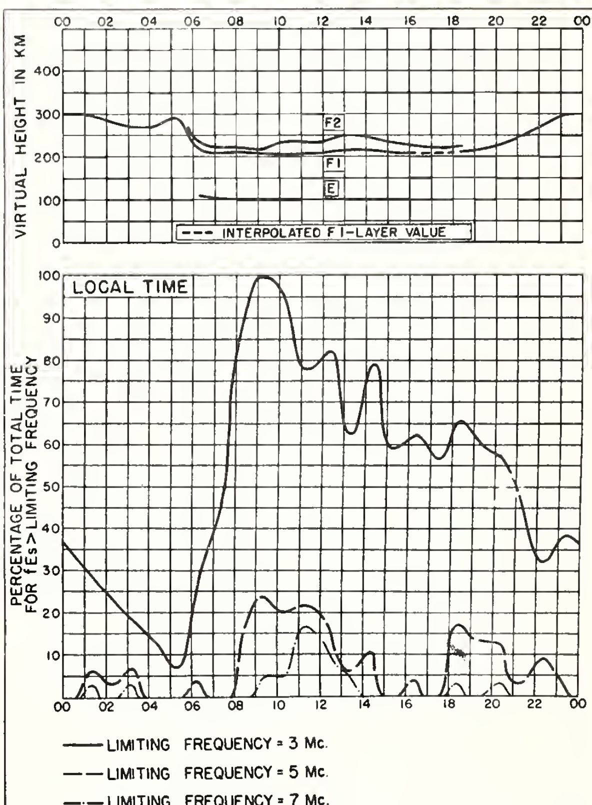


Fig. 46 SHIBATA, JAPAN OCTOBER 1948

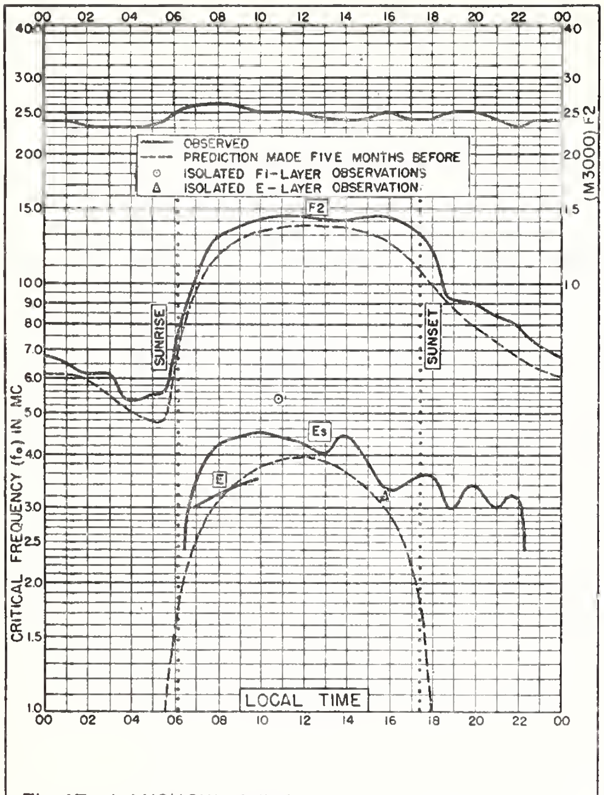


Fig. 47. LANCHOW, CHINA
36.1°N, 103.8°E OCTOBER 1948

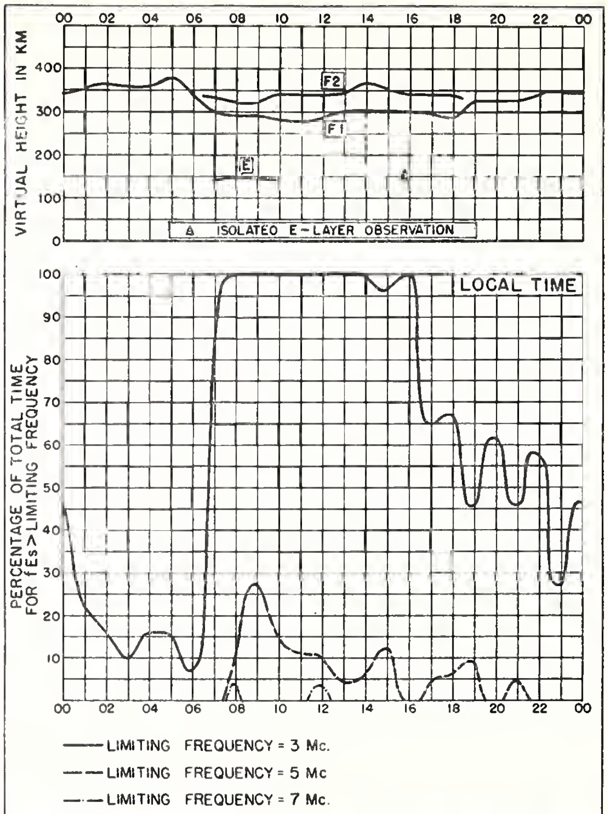


Fig. 48. LANCHOW, CHINA OCTOBER 1948

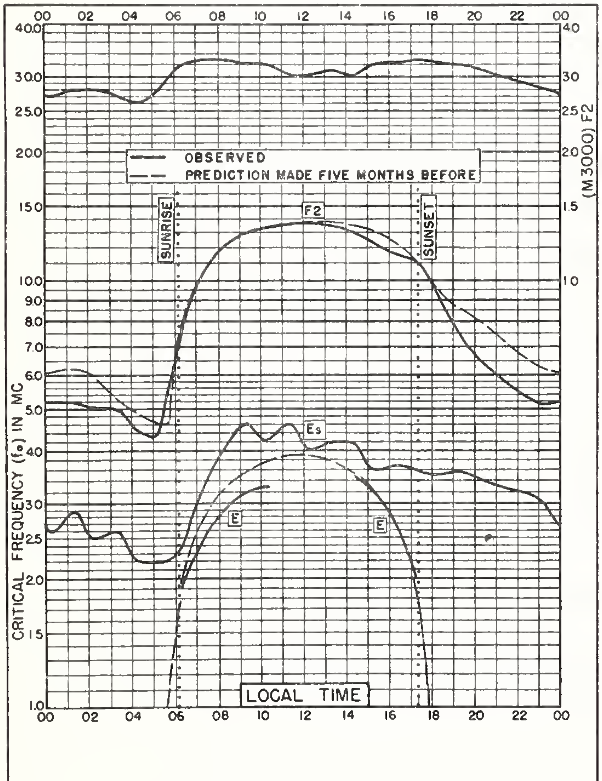
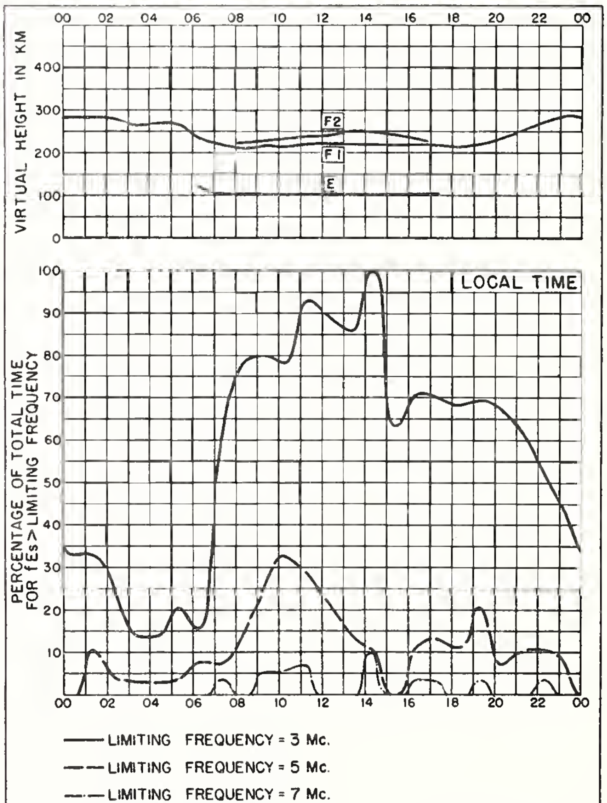


Fig. 49. TOKYO, JAPAN
35.7°N, 139.5°E OCTOBER 1948



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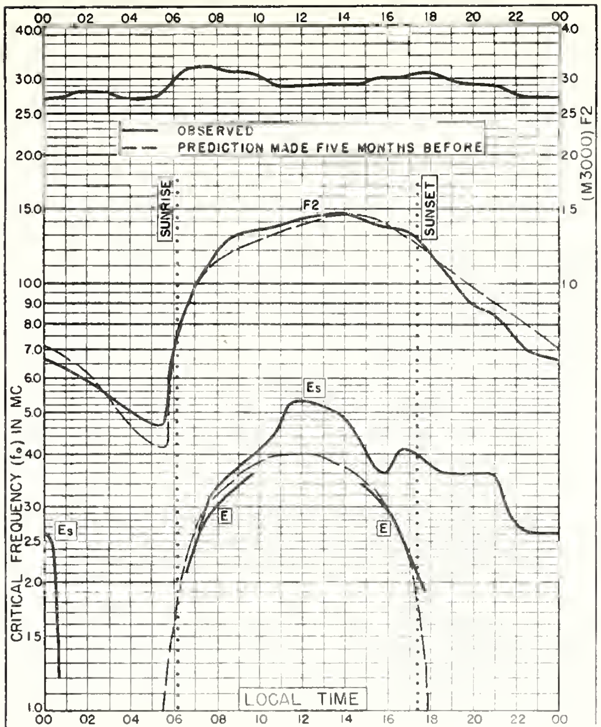

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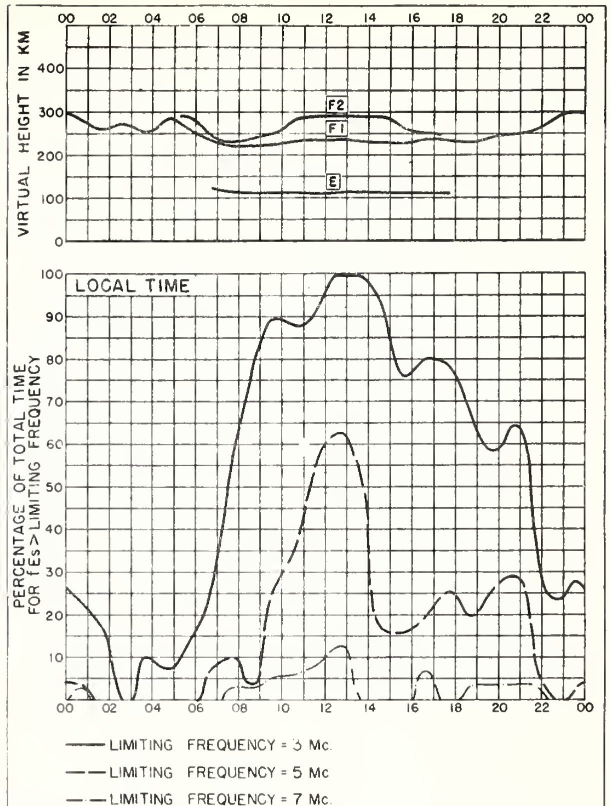

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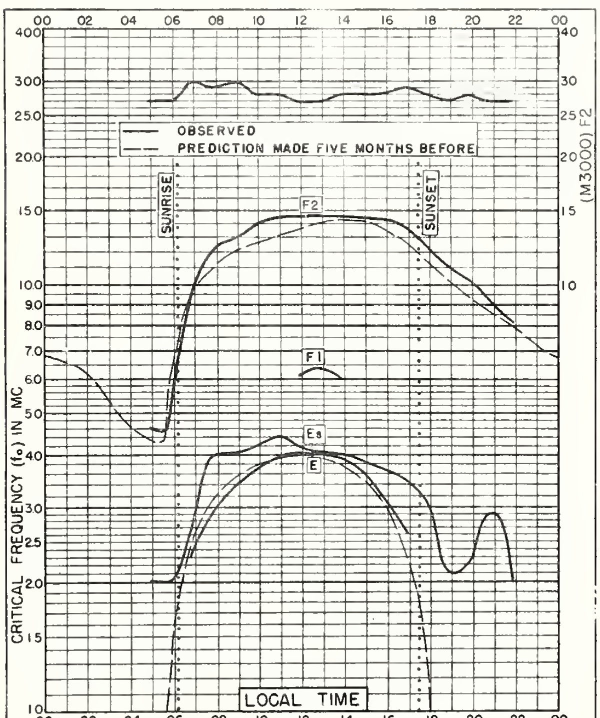

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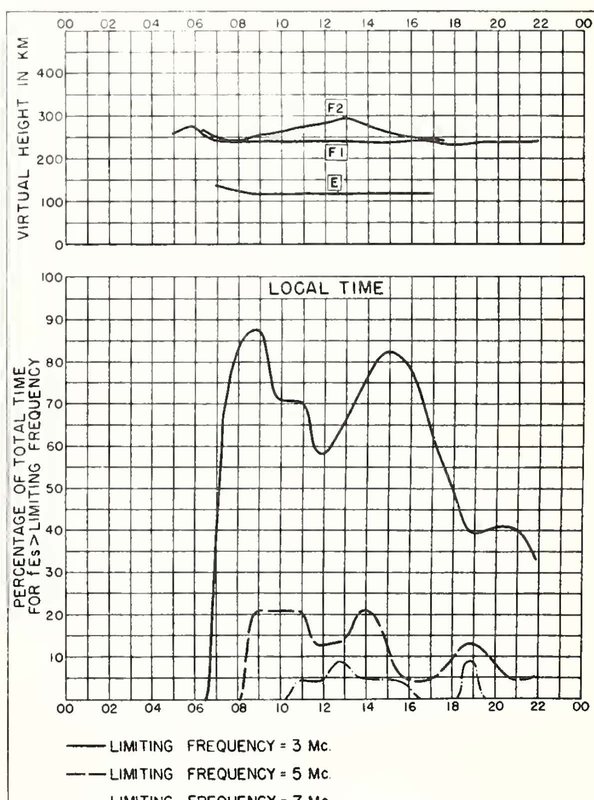

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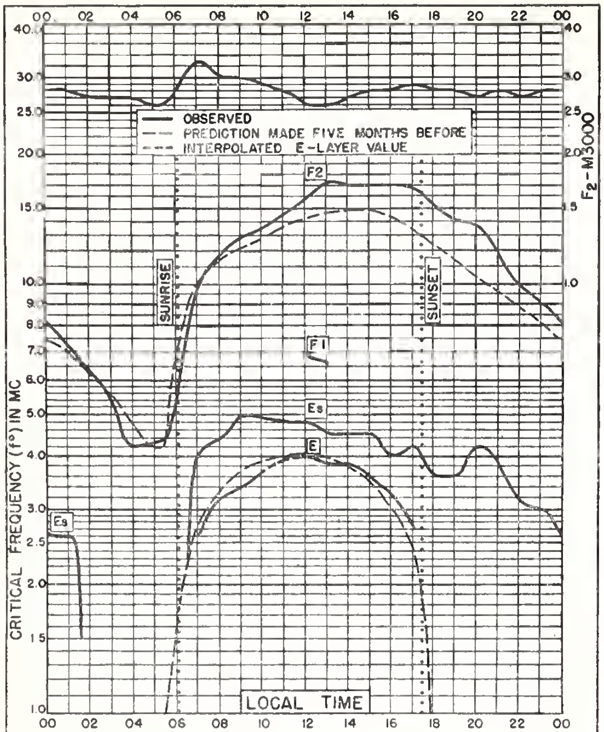

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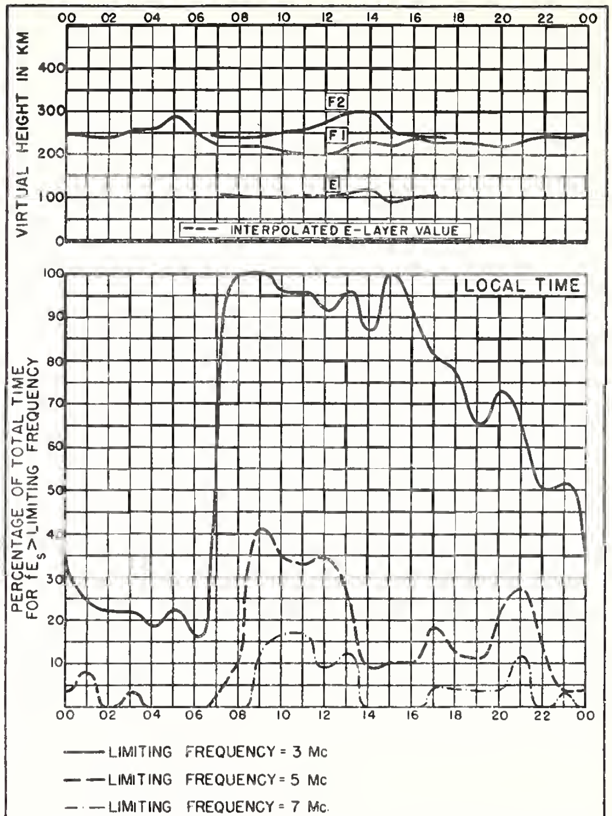

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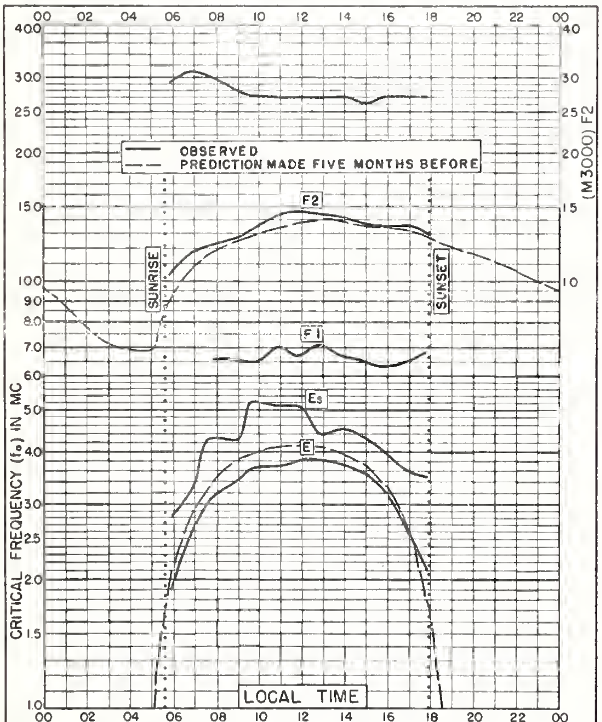

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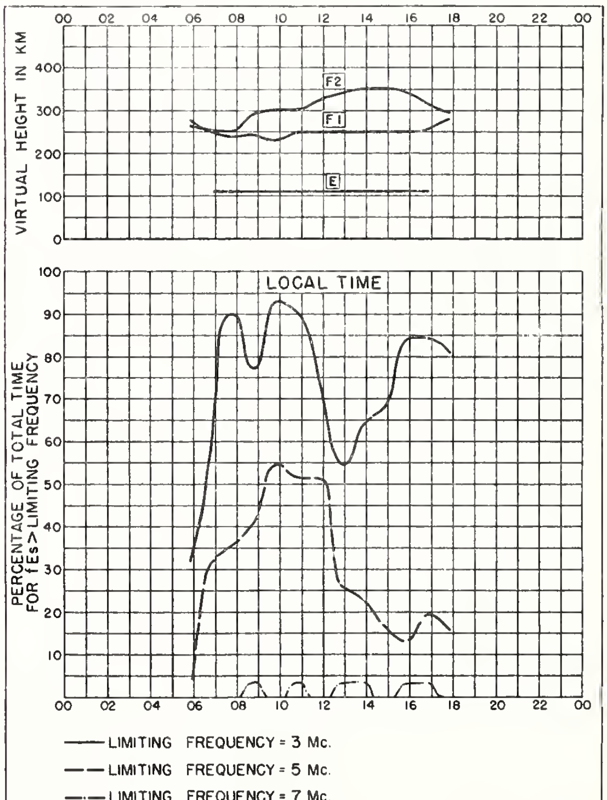

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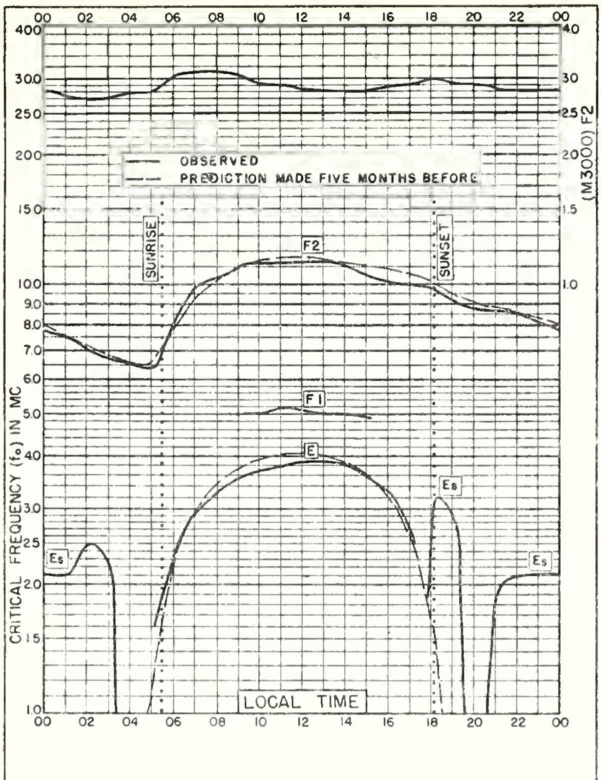

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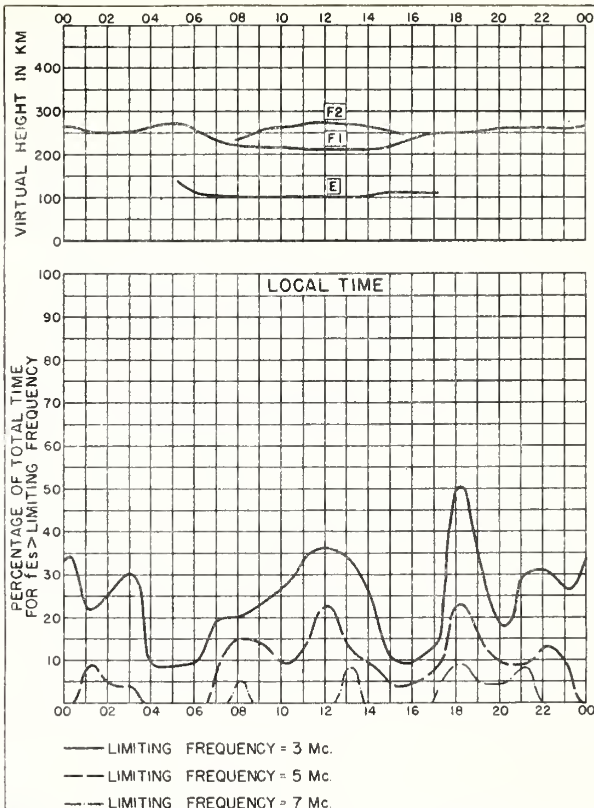

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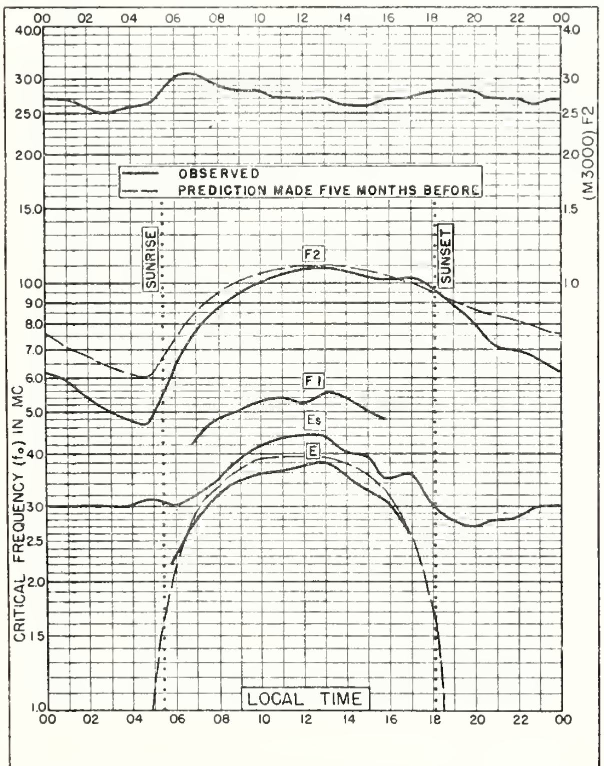

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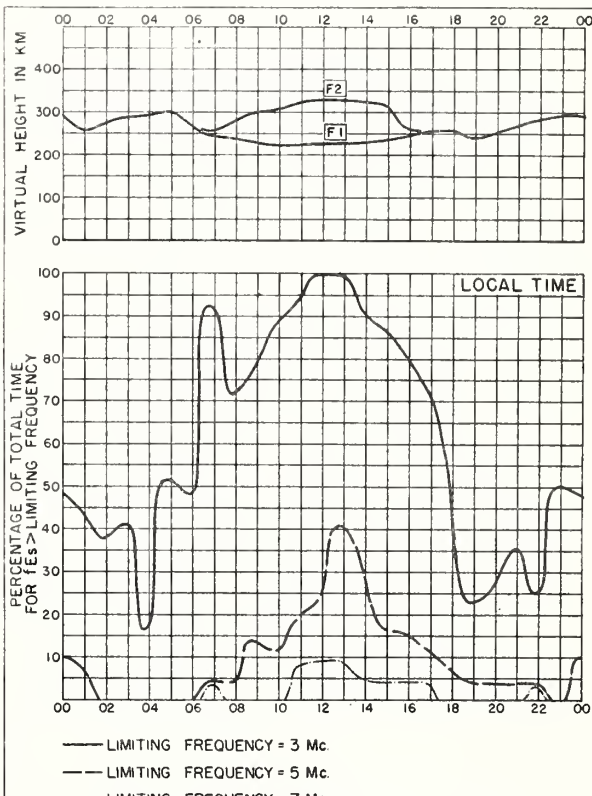

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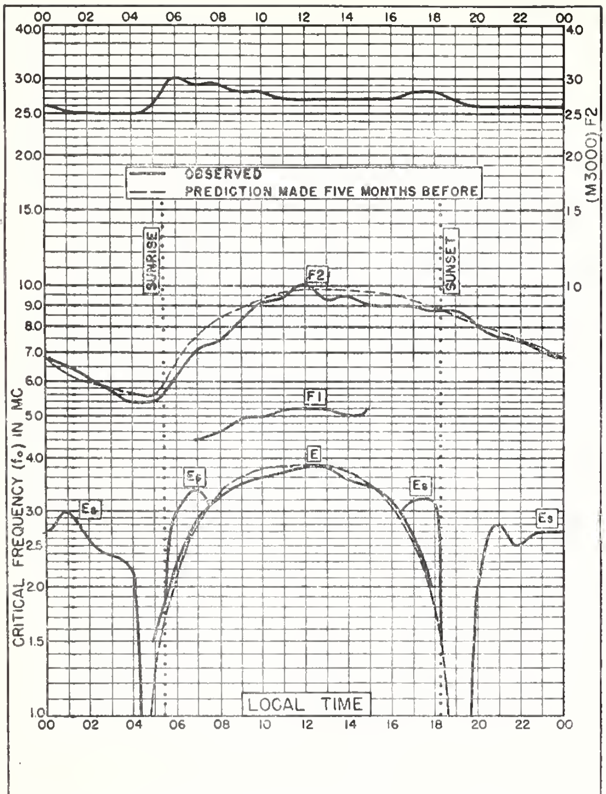

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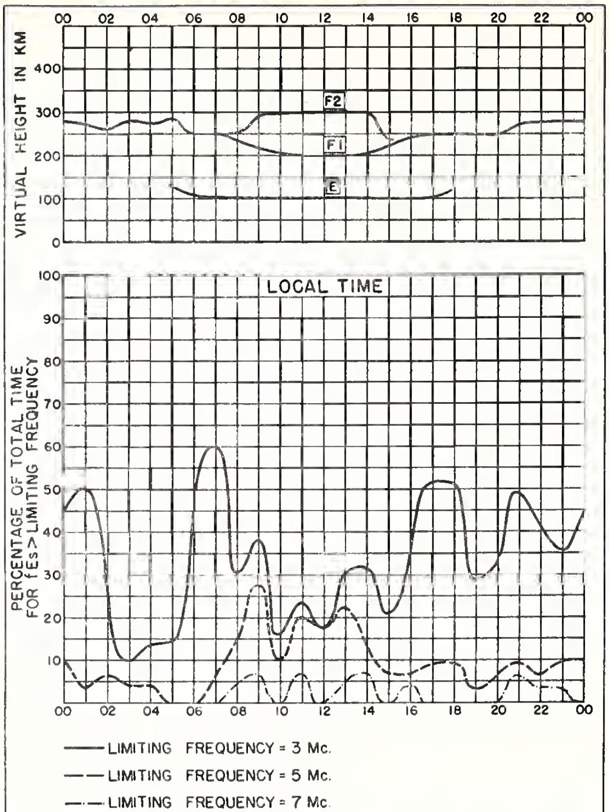

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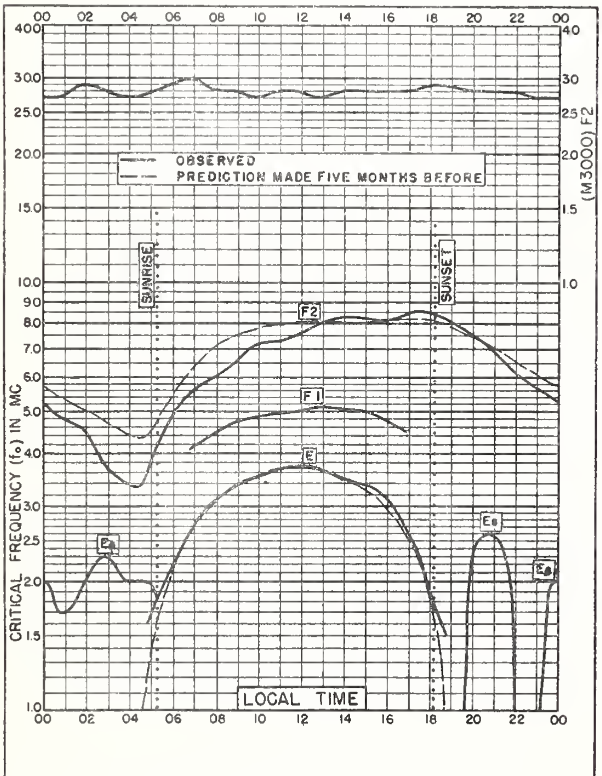

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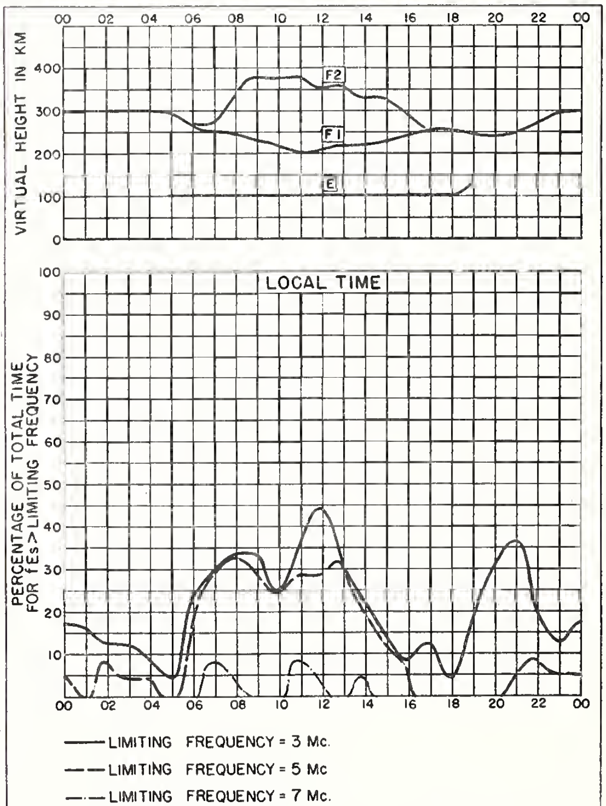

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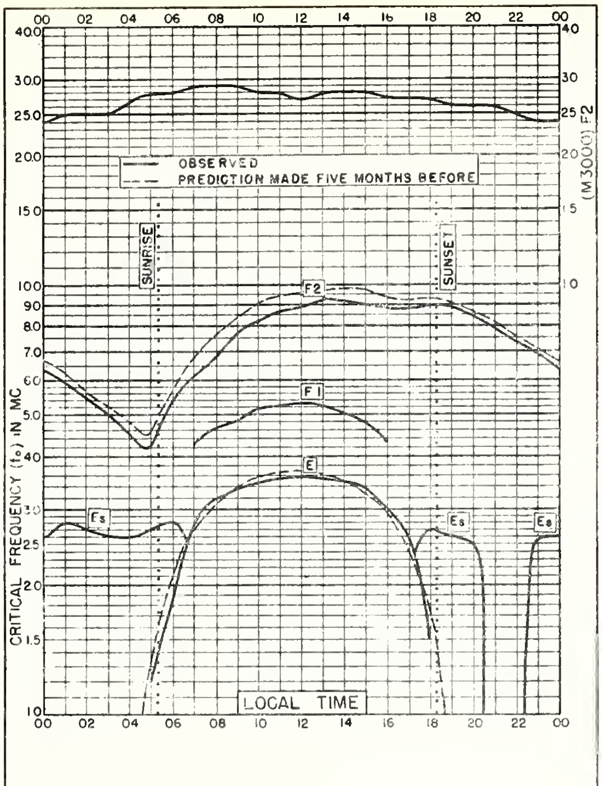

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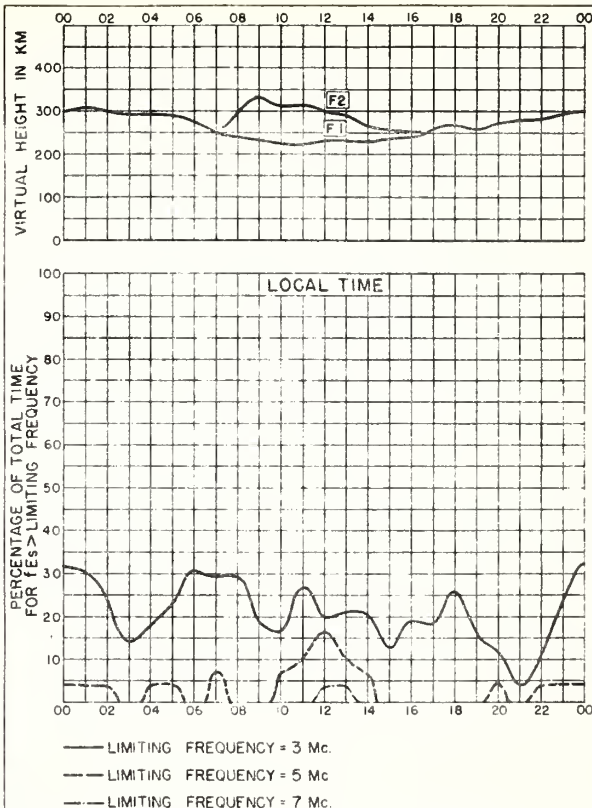

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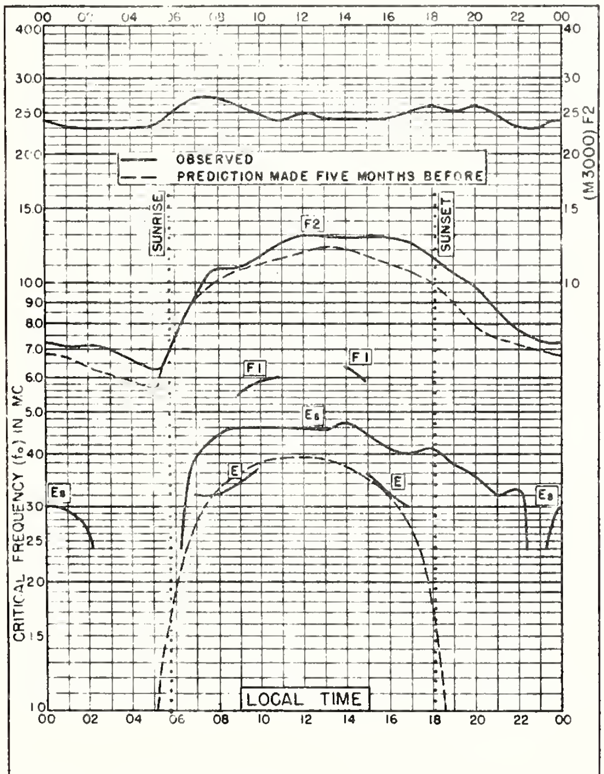

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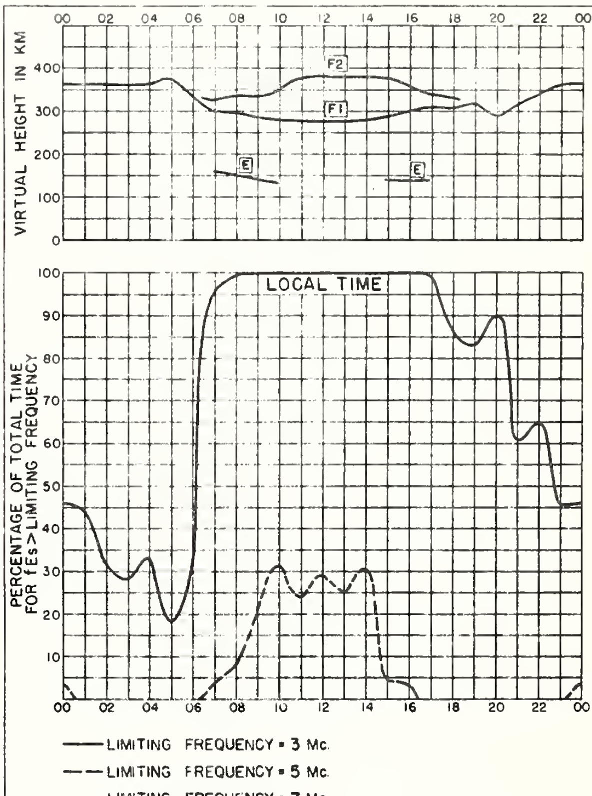

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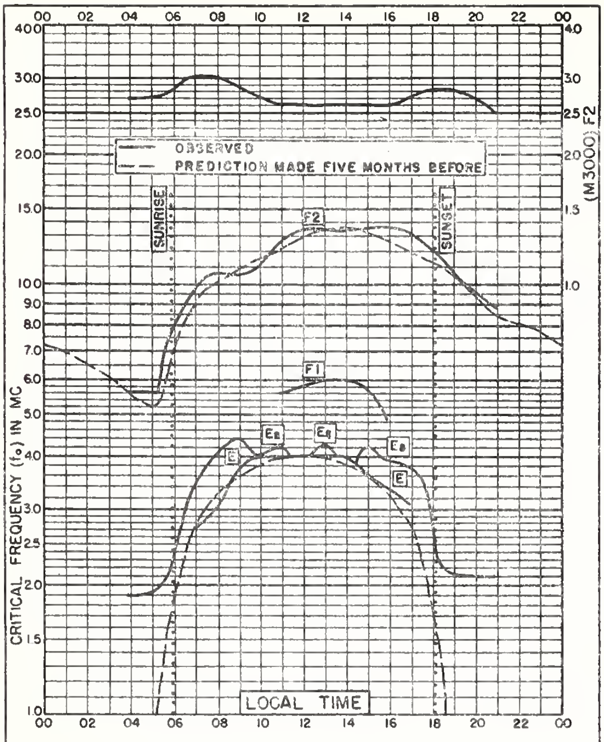

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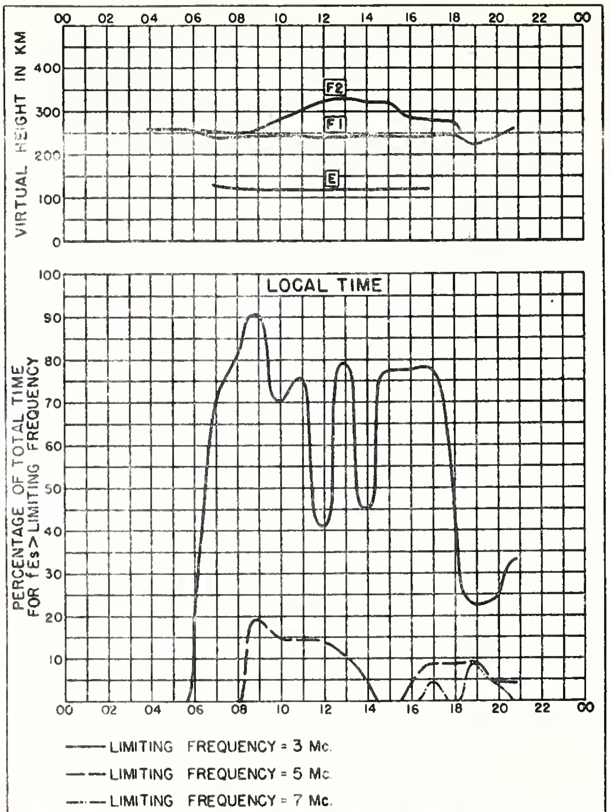

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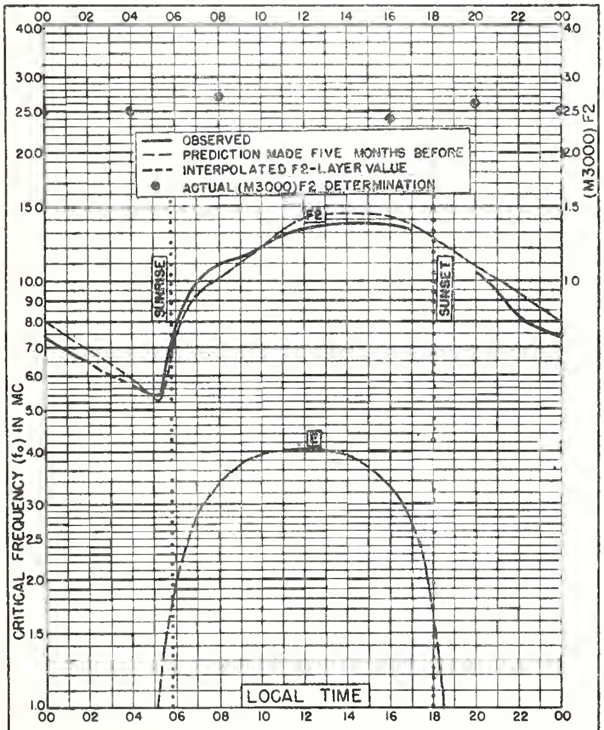

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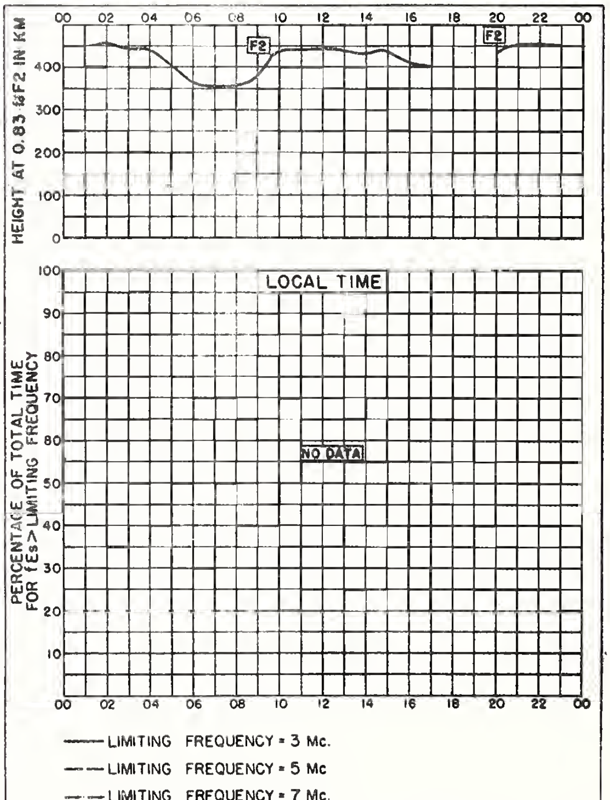

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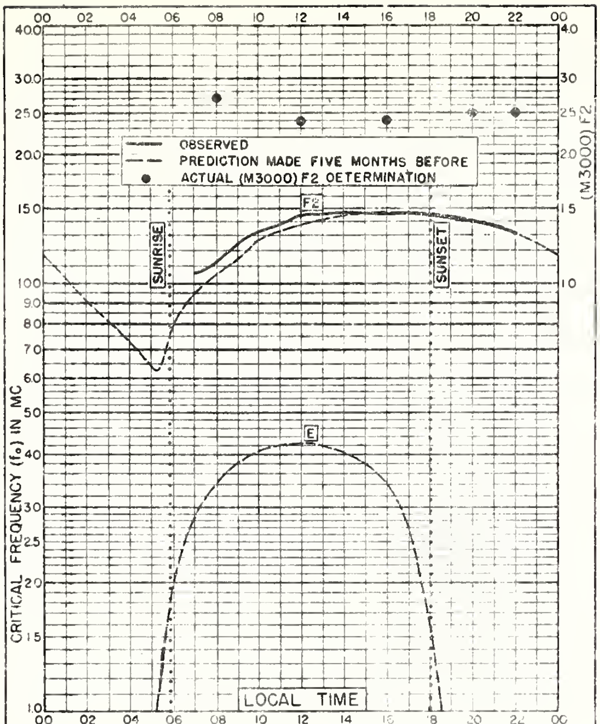

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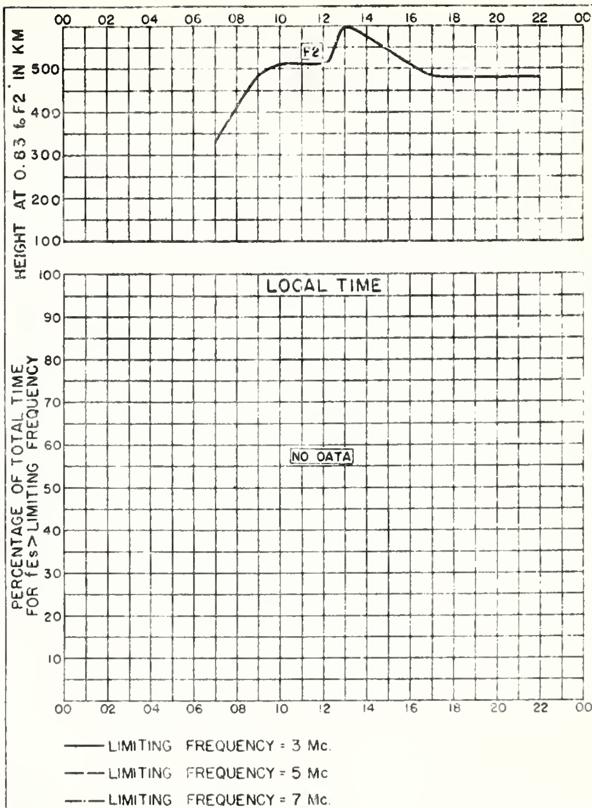

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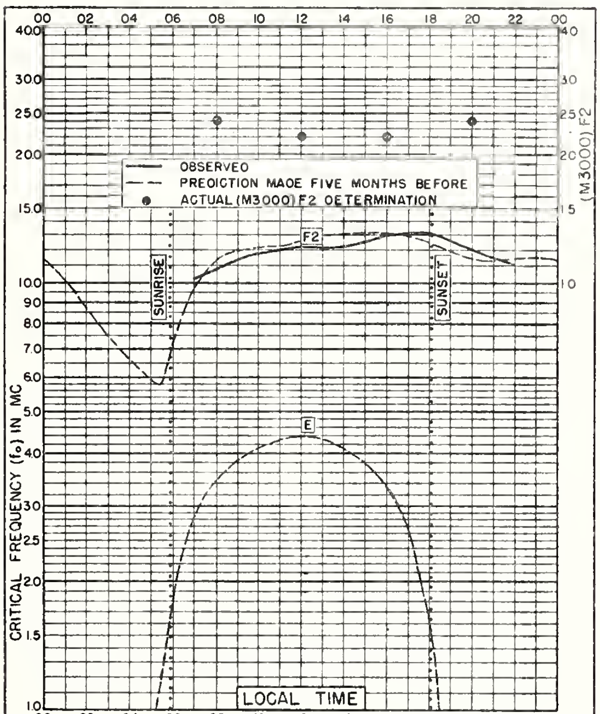

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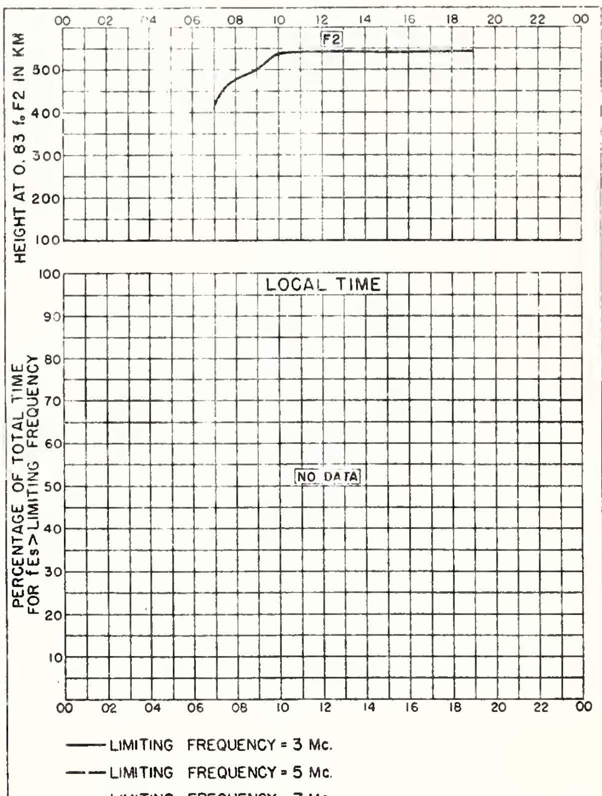

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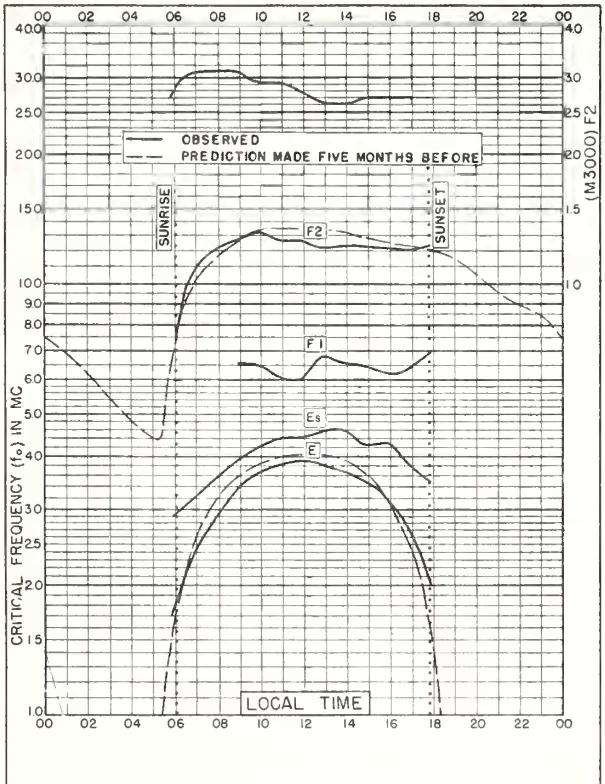

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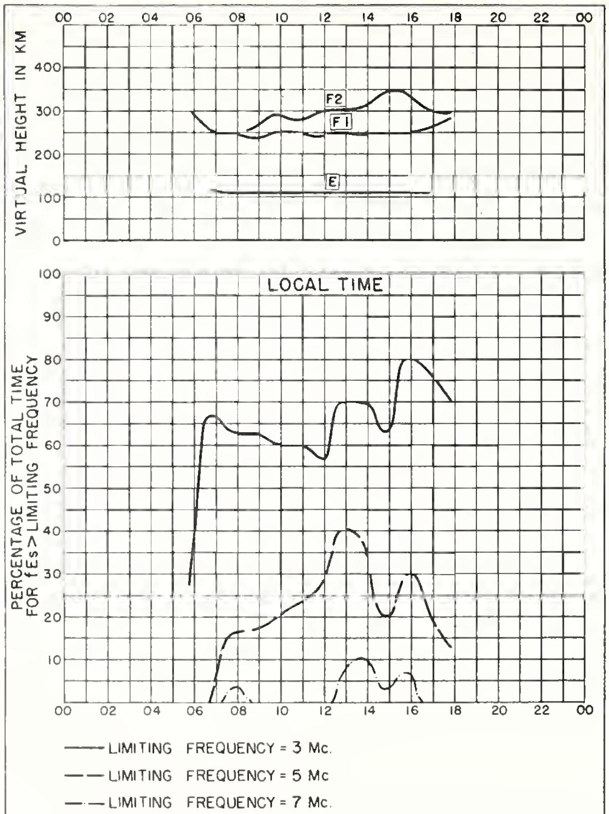

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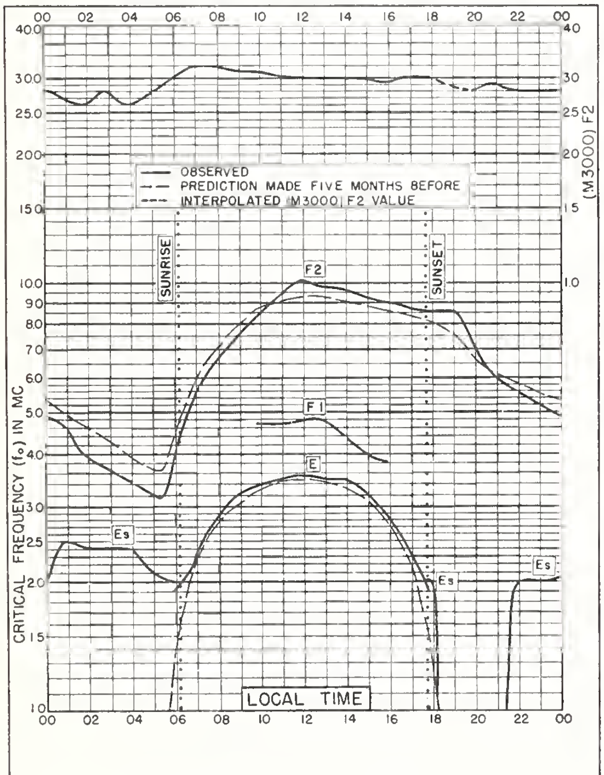

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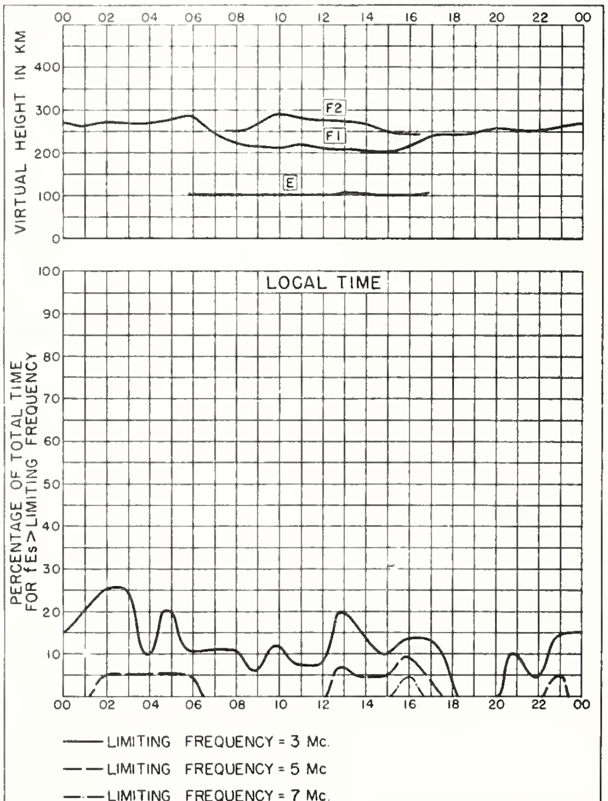

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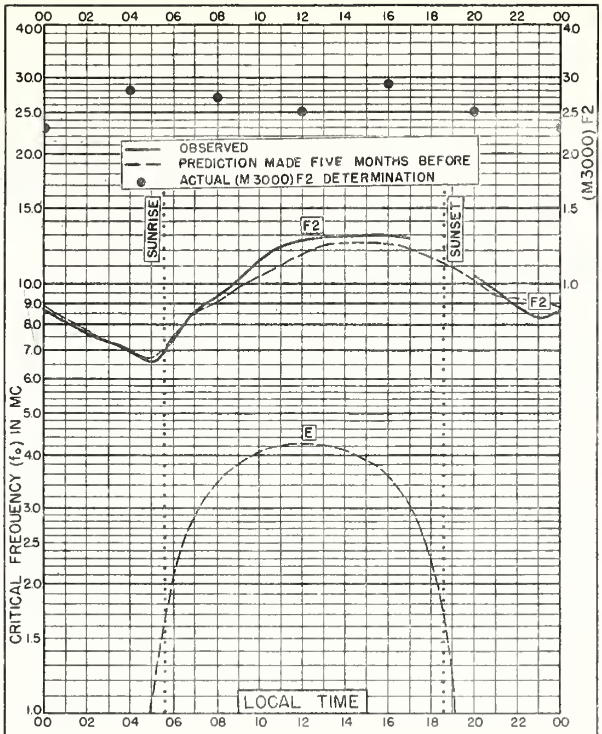

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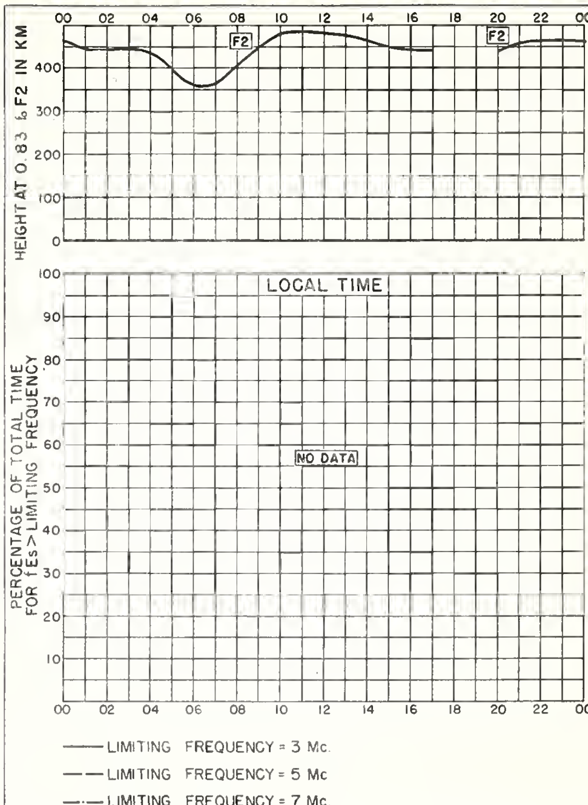

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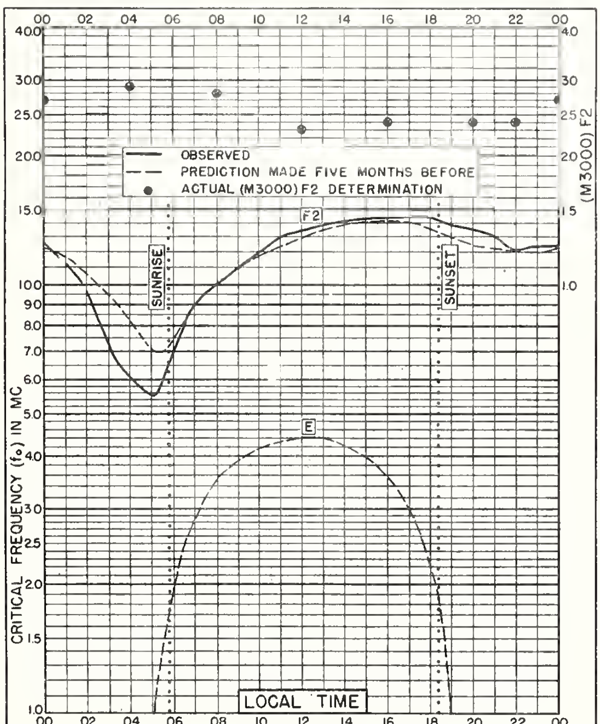

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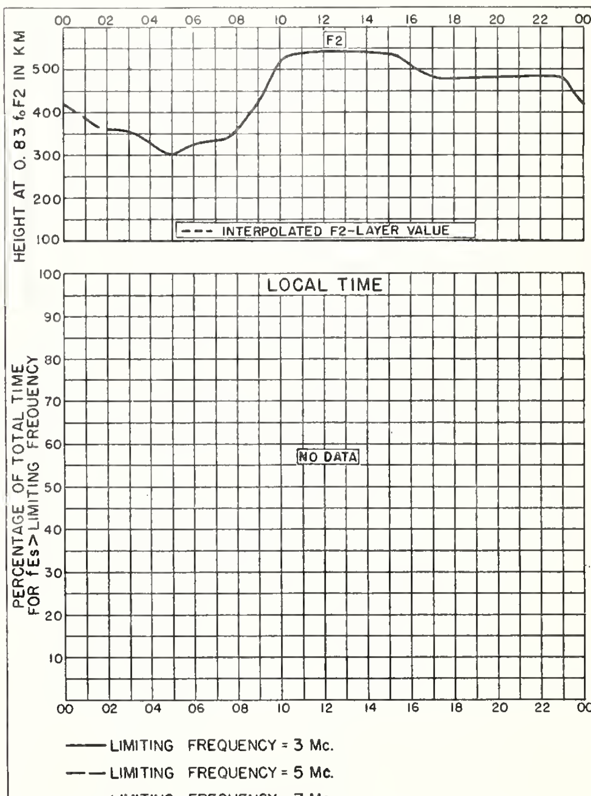

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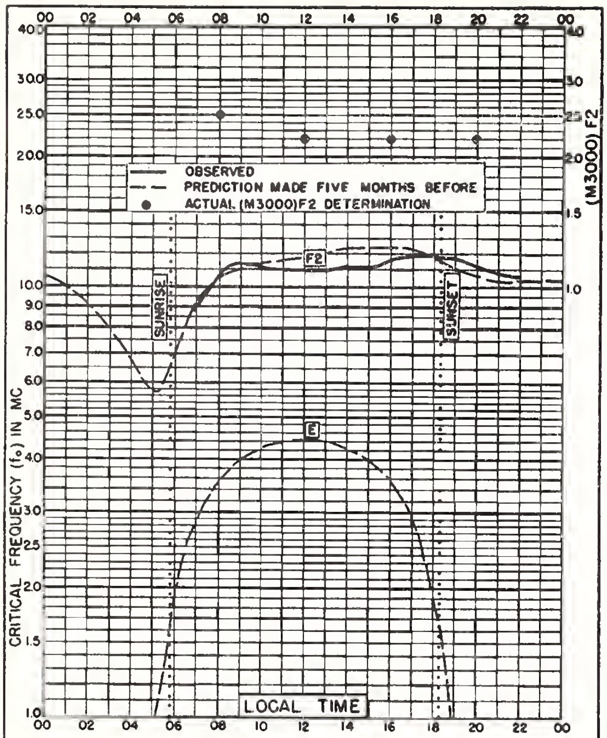

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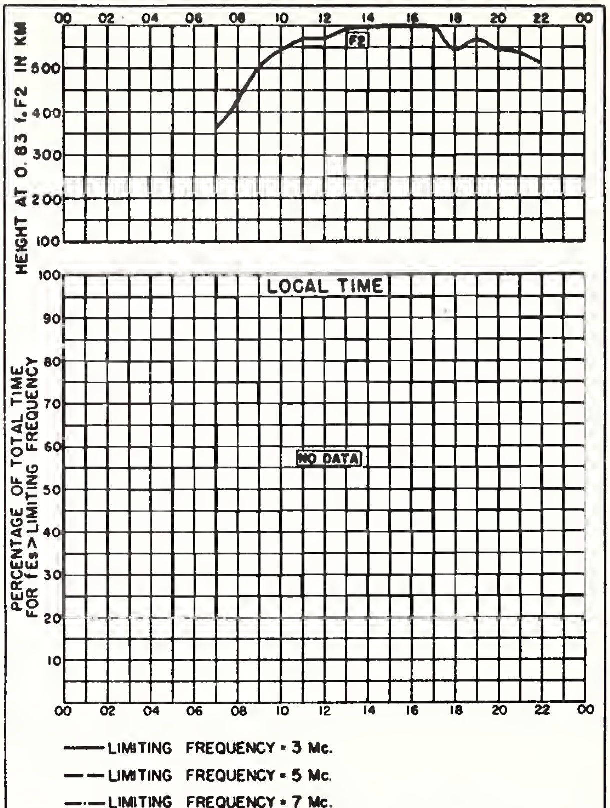

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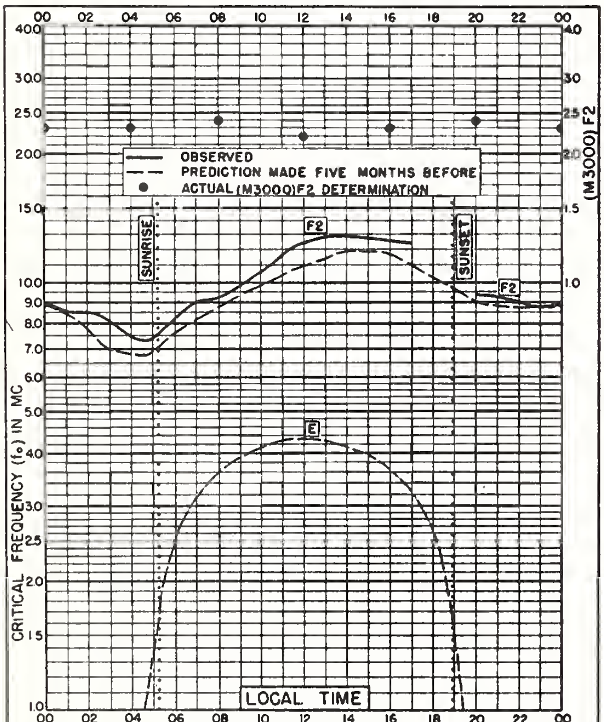

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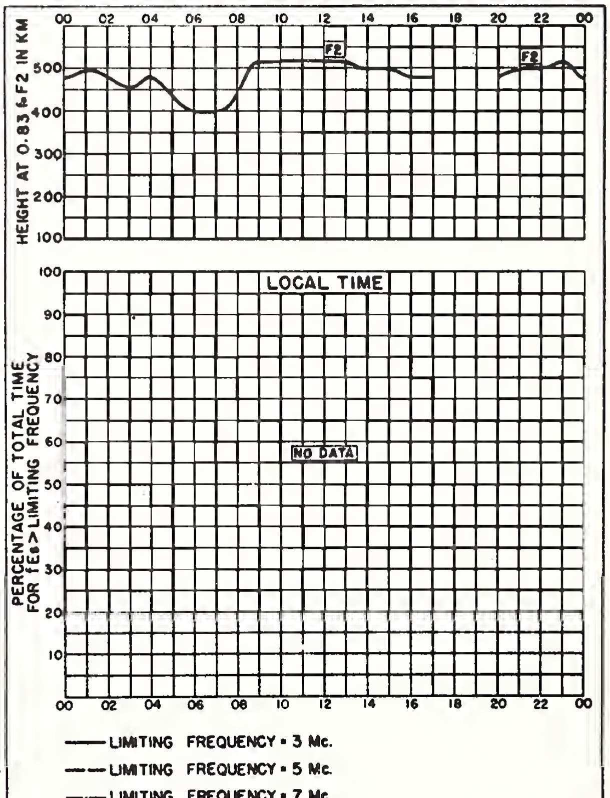

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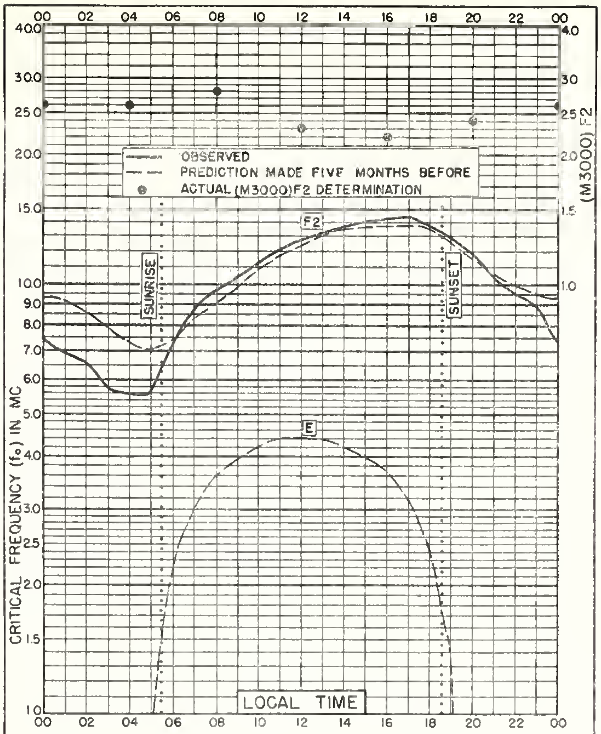

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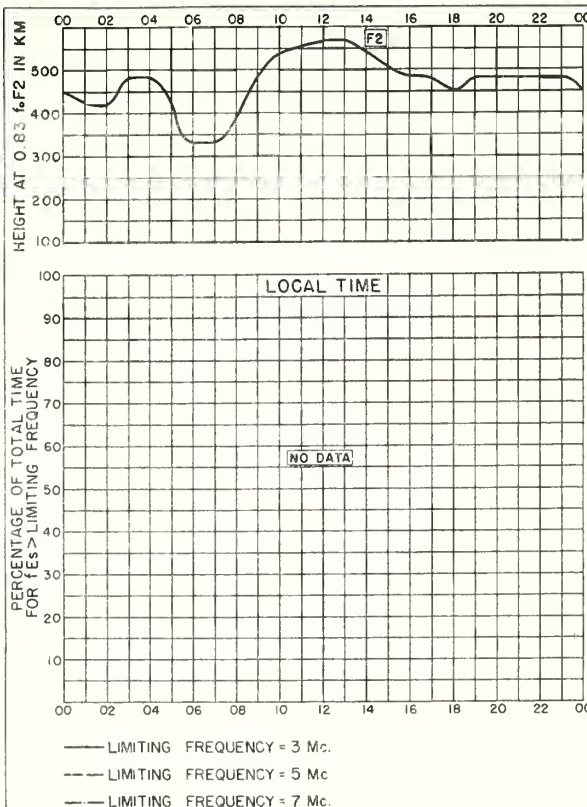

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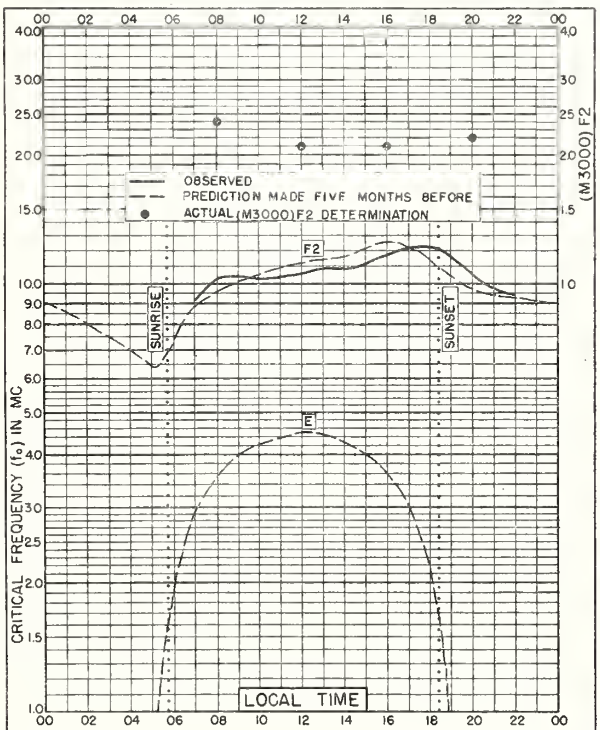

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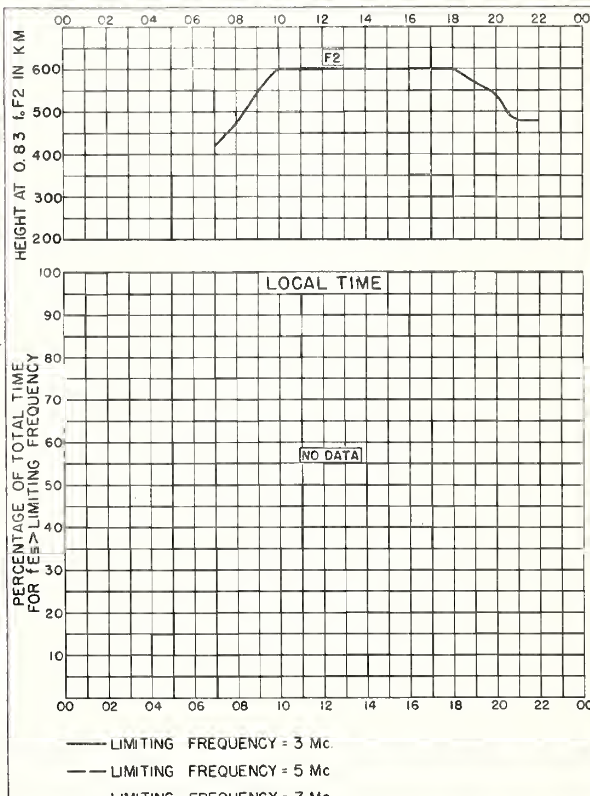

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